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Developments in Carrier Systems

TWO ENTIRELY NEW and somewhat revolutionary developments are discussed in this article, which will greatly influence carrier system design and which will make the new systems differ greatly from the conventional types now in use. These are the magnetic generation of various carrier current frequencies and the use of the copper-oxide rectifier arrangement in a bridge network

By ARTHUR L. ALBERT

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ABOUT 20 years ago the first carrier telephone systems were installed for commercial use. They were made possible by the vacuum tube and by the electrical wave filter. The use of carrier systems has increased until today they are a very important part of the telephone plant.

The earlier types A and B systems were soon replaced by the type C carrier system. Installations of type C carriers, giving three additional telephone channels, have been numerous, and this system has for years been the standard for use over long distances. The equipment has, of course, been modified from time to time and many improvements have been incorporated. About ten years ago the type D carrier was announced. This was a one-channel system designed for installation over short distances.

In all these carrier-telephone systems the vacuum tube served at least three very important functions: First, the carrier waves were generated by vacuum-tube oscillators; second, the carrier waves were modulated by the voice frequencies in vacuum-tube modulators; and third, vacuum tubes were used to amplify the modulated carrier for transmission to the distant station. At this receiving point vacuum tubes were used again in amplifiers, oscillators, and demodulators to render the conversation audible to the human ear.

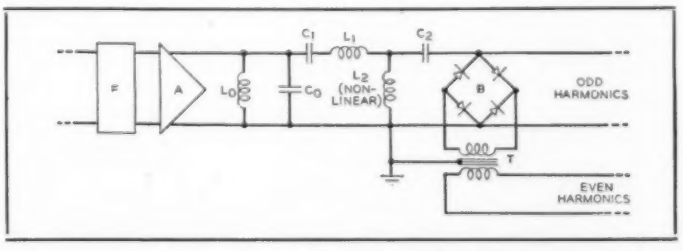
Within the last several years additional carrier systems have been announced. As described by H. A. Affel in the Bell Laboratories Record for April, 1937, three of these are broadband systems going far beyond the 30,000 cycle frequency long considered the approximate upper limit for economical carrier operation.

Why Higher Frequencies May Be Used

It is interesting to review some of the important developments making possible the use of high frequencies. According to the article just mentioned, a 12-channel carrier for cables will have a top frequency of 60,000 cycles and the upper limit of a 12-channel carrier for open-wire lines will be 140,000 cycles.

This latter system will be used on the same circuit with type C carriers which may be occupying the low-frequency band. Then, too, there is the elaborate system for providing, theoretically, 240 telephone channels on the New York-Philadelphia coaxial cable.

An increased knowledge of the performance of circuits and equipment at the higher carrier frequencies is an important factor in making these new carrier systems possible. A decrease in the spacing in open-wire lines, giving *less* spacing between



(Courtesy of Bell System Technical Journal.)

Fig. 1. Simplified circuit diagram of the magnetic generator.

wires of a pair and *greater* spacing between pairs, reduces the crosstalk problem.

The negative feed-back amplifier devised by Black provides a very stable high-gain amplifier for the new high-frequency carrier systems. Other and perhaps equally important developments, such as the perfection

(Courtesy of Bell System Technical Journal.)
Fig. 2. Output wave form of the magnetic harmonic generator. This badly distorted wave contains the odd harmonics. The even harmonics are produced by the rectifier circuit B of Fig. 1.

of sharply-tuned crystal filters, have occurred in recent years.

It is not the purpose of this article to dwell at length on all these details, important though they may be. It is the purpose, however, to consider two entirely new and somewhat revolutionary developments which will greatly influence carrier system design, and which will make the new systems differ greatly from the conventional types now in use. Furthermore, it will be impossible to discuss these new systems in detail because they appear yet to be in the developmental stage and the literature does not seem to contain complete discussions of them.

New Principles Involved

These two new developments probably will replace the vacuum tube in two of its important uses in carrier systems of the future. In existing carrier systems the carrier waves are generated at both the transmitting and receiving stations by vacuum-tube oscillators.

It now appears that in future systems these various carrier frequencies will be generated magnetically. By the magnetic distortion of an impressed wave a group of harmonics can now be produced which will provide the various carrier frequencies necessary for a multiple-channel carrier system.

Furthermore, in the conventional carrier systems vacuum-tube modulators have been used at the sending end, and similar vacuum-tube demodulators in the receiving equipment. In future carrier systems it is probable that the copper-oxide rectifier or Varistor elements, arranged in a bridge network, will perform these functions for the vacuum tubes.

This does not mean that the vacuum tube is completely out of the picture. Even if it is to be replaced by other methods for carrier generation and for modulation and demodulation, it will still be extensively used for amplification and for other special purposes. Furthermore, the use of these Varistors is at present limited to low power levels and to frequencies below several hundred thousand cycles.

Magnetic Generation of Carrier Frequencies

It is well known that if a pure sine wave alternating voltage is impressed on an iron-cored coil, the current which flows will *not* be a pure sine wave, but will be distorted. Harmonics of the fundamental impressed wave will exist in this current. These new frequencies (that is, the harmonics) are generated magnetically in the iron-cored coil. Such a coil is said to be non-linear and the distortion, non-linear distortion.

The magnetic generation of harmonics in this general manner was fully discussed by Peterson, Manley and Wrathall of Bell Telephone Laboratories in Electrical Engineering for August, 1937. The material and illustrations in the following paragraphs are largely from this article.

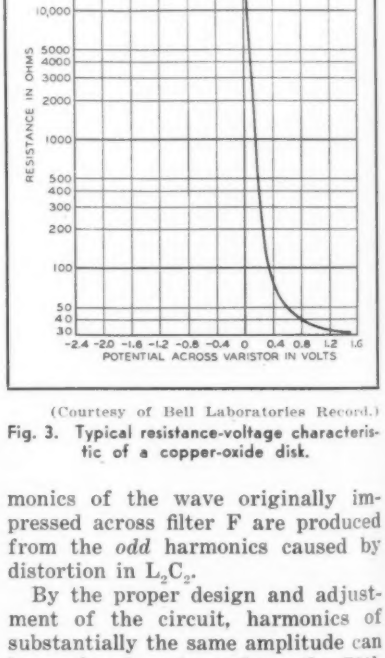
A simplified circuit diagram of the system for the magnetic generation of a group of carrier waves is shown in Fig. 1, and the operation of the circuit is essentially as follows: The fundamental wave to be distorted is impressed across the filter, F, which is sharply tuned to remove any spurious components; this input is amplified at A.

The parallel resonant circuit, L_0C_0, is tuned to this fundamental frequency and so filters out any second harmonic component generated in the amplifier. The series resonant circuit, L_1C_1, insures that the current flowing to the distorting network is a sine wave and reduces the circuit reactance.

The distortion producing the harmonics of the impressed wave is caused by the action of the small saturated permalloy-cored coil, L_2, and the condenser, C_2. By properly proportioning these and the load impedance (not shown), a highly-peaked output current results which contains the desired harmonics. The exact nature of this action is not readily explained and those interested are referred to the article previously listed for a complete analysis. The shape of this distorted output current is shown in Fig. 2.

As is well known, only odd harmonics are produced by non-linear distortion, such as caused by an iron or permalloy-cored coil or transformer. An ingenious method of obtaining the even harmonics is used. As shown in Fig. 1, a full-wave rectifier is connected across the output circuit, and this will have voltages due to the odd harmonics impressed across it.

Those familiar with rectifier operation will recall that for half-wave rectification the first alternating component in the rectified wave will be the same frequency as the rectified alternating voltage, but for *full-wave* rectification the first component will be *twice* the frequency of the fundamental. Thus, by the action of the full-wave rectifier *even* har-



(Courtesy of Bell Laboratories Record.)
Fig. 3. Typical resistance-voltage characteristic of a copper-oxide disk.

monics of the wave originally impressed across filter F are produced from the *odd* harmonics caused by distortion in L_2C_2.

By the proper design and adjustment of the circuit, harmonics of substantially the same amplitude can be produced up to perhaps the 70th harmonic. Of course, all of these may not be needed in a single carrier installation, but those desired may

readily be selected by filters. Furthermore, the magnitude of these components is reported to be sufficient for modulation without intervening amplification. The simplicity of this is apparent.

Copper-Oxide Rectifiers or Varistors

As previously mentioned, copper-oxide rectifier or Varistor units seem destined to replace the vacuum tube as modulators and demodulators in the new carrier systems. These interesting electronic devices were announced by Grondahl and Geiger in the Journal of the AIEE for March, 1927, and have been commercially available since about that time. Up to the present their uses have largely been as rectifiers, and as such they have been widely employed.

The copper-oxide unit consists of copper disks on which have been formed thin layers of cuprous oxide. Current (conventional direction) flows through the unit more readily from the oxide to the copper than in the reverse direction. Since each disk can only withstand a few volts without the oxide layer being punctured for higher voltages, several of the disks are sometimes bolted together with layers of some soft metal such as lead between them. This metal only performs the function of a current-collecting electrode.

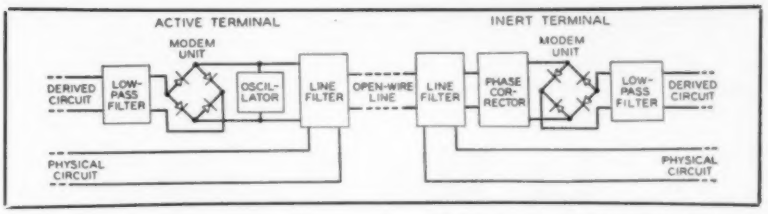
The characteristics of a copper-oxide disk is shown in Fig. 3, and the way in which the resistance varies with the impressed voltage is evident.

The name Varistor is quite appropriate. It is apparent that such a device will function as a rectifier since its resistance is high in one direction and is low in the other. This use was indicated in Fig. 1. In fact, these rectifiers are being used for supplying power to some carrier systems direct from a-c power sources instead of using battery supply as in the older installations. This use is explained by Dickieson in the Bell Laboratories Record for November, 1937.

Copper-Oxide Modulators and Demodulators

The use of copper-oxide units for modulators and demodulators is not so apparent as for rectifiers. The connections in a one-channel carrier system are indicated in Fig. 4, from an article by Blessing entitled, "Modulation in the G-1 Carrier System," and published in the Bell Laboratories Record for March, 1937.

No attempt will be made to explain completely the action of these devices in modulating and demodulating the signal. Blessing explains the action of these units as switching devices. When used for this purpose these units are sometimes called *Modems*, a word devised from modulators and demodulators.



(Courtesy of Bell Laboratories Record.)

Fig. 4. Simplified block schematic of the G-1 carrier telephone.

From another, and perhaps more fundamental standpoint, the action can probably be explained on the basis of a non-linear circuit element. Thus, in discussing Fig. 1 it was shown that the copper-oxide bridge network *created* new frequencies by a process of distortion. Similarly, it can undoubtedly be shown that in modulating the signal these Varistor units create the side bands, and that in demodulating they create the desired voice-frequency component just as in the vacuum-tube modulators and demodulators. Very little, if anything at all, seems to have been published giving such an explanation.

Future Trends in Carriers

Hazardous as it is to predict future trends, it is nevertheless probably safe to say that future carrier systems will be more independent of battery supply, and in many instances will be operated from 110-volt, alternating current sources. Also, they will be much more compact and have much simpler circuits.

Crystal filters will be employed in the broad-band carrier. Also, the generation of the carrier frequencies will be by magnetic means. And finally, modulation and demodulation will be accomplished by the new member of the electronic family, the copper-oxide rectifier or Varistor.

[AUTHOR'S NOTE: Several papers giving detailed information on the new carrier circuits discussed in this article were presented at the Mid-Winter Convention of the American Institute of Electrical Engineers recently held in New York. Current issues of Electrical Engineering will no doubt carry these articles.]

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Lineman Stays at Pole Top; Cougars Below

An Associated Press dispatch from Tillamook, Ore., tells of a lineman's "quite unusual" experience last month. The story concerns Alvin Wells, telephone lineman. Working 14 miles from Yamhill, Ore., he attached his portable telephone set to the wire and called Emil Broms, Tillamook manager for the Pacific Telephone & Telegraph Co., saying:

"Wells talking. There are two cougars below eying me."

A few minutes later as he got to the top of the pole, he called again, saying: "There are four cats now. They look hungry."

He succeeded in waiting them out., the dispatch stated. While cougars do come down out of the mountains during February and early March when the snow becomes deep, a delegation of four is "very unusual." Of course, in these times, if the report had said the lineman found four wolves at his door, it would be considered quite the usual thing. But maybe the cougars wanted to place a toll call!

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New Issue of Lincoln, Neb., Directory

The Lincoln Telephone & Telegraph Co., Lincoln, Neb., is distributing approximately 25,000 copies of its regular issue of the Lincoln exchange directory, which appears every eight months. The company has featured unusual and interesting cover designs for several years on these issues. This new directory shows in outline the 22 counties in southern and southeastern Nebraska that it serves.

As usual, the directory carries several thousand changes in listings along with a moderate increase in the number of patrons now served. The book contains a street guide and city map and other information brought up to date. The classified section has increased from 88 to 90 pages.

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Only One Arabian City Has Telephone Service

The only telephone service in Arabia, according to a report from the American Consulate at Aden is in the city of Aden itself. There are no long distance connections elsewhere, except to the palace of the Sultan of Lahej, 25 miles from Aden, and which was installed at his personal expense.

In the Nation's Capital

By FRANCIS X. WELCH

Special Washington, D. C., Correspondent for TELEPHONY

COMMENTS PRESENTED ON Federal circuit court decision concerning labor relations and its definition of interstate commerce for purposes of labor regulation. . . . Troubles of the FCC in ruling on applications for competitive radio circuits to foreign points. . . . FCC adopts resolution to investigate chain broadcasting and monopoly in the broadcasting industry

ALTHOUGH not directly involving the telephone industry, perhaps the most important event of the past fortnight—taking a long range viewpoint—was the decision of a U. S. Circuit Court in New York concerning the labor relations of the Consolidated Edison Co., which operates the gas and electric service in and about New York city.

Some readers may recall this writer's prediction that this case would result in a very significant precedent. He still thinks so, even though the decision was, for the most part, buried in the news of wars and what not. In a word, it means that you, you, and you may well be subject to the National Labor Relations Board, no matter how local you think telephone business may be.

HERE IS a gas and electric utility which operates entirely within the New York state portion of the metropolis of New York city. Early last year the company was confronted with conflicting demands of rival CIO and AFL unions for recognition as the sole bargaining agency for the system's employes (which number about 40,000).

The management, after canvassing the situation, apparently decided that the AFL union had the better of the situation and forthwith concluded an exclusive bargaining contract, making the Consolidated system an AFL "closed shop" to all intents and purposes.

The CIO, as usual, entered complaint with the NLRB; and the latter, with its usual sympathy, denounced the Consolidated-AFL contract as an attempt to deal with a "minority." The contract was set aside and an open election ordered. The company appealed to the courts. Two principal issues were presented:

1. Is a utility company which confines its physical operations entirely to one state subject to the Federal control of the NLRB?
2. Does the NLRB have the right to set aside a contract openly entered into at arm's length between an employer and an absolutely independent union (such as a unit of the AFL is supposed to be)?

PROBABLY the first of these points is more important, especially as precedent for other types of utilities, including telephone companies. In a word, the court held that the Consolidated Edison Co., which is engaged presumably in intrastate commerce for purposes of state commission rate and service regulation, is engaged at the same time in interstate commerce for purposes of labor regulation. Judge Swann in his opinion stated:

> Although the bulk of the petitioners' business, in respect to both the quantity of service and the number of consumers, is supplying electricity and gas for residential and local commercial uses, they also have numerous consumers who are engaged in interstate and foreign commerce. The most striking illustration of this class of consumers is the railroads.

A pertinent comment on this decision was made by a weekly Washington letter service (P. U. R. Executive Information Service) as follows:

> Carried to its logical conclusion, this may mean that any utility, no matter how local its own physical operations may be, is engaged in interstate commerce if it serves important customers who are so engaged (such as carriers). It is difficult to see how the most local type of utility operation would be exempt from Federal labor control under this doctrine. An appeal will doubtless be made to the U. S. Supreme Court.

On the second issue, the Circuit Court found (as did the NLRB) that the AFL did not have a majority of the Consolidated Edison employes organized when the bargaining contract was executed and that it was the NLRB's right and duty, therefore, to set the contract aside.

GOING BACK to the first point, however, if the Supreme Court upheld this new doctrine of transmutation of intrastate status by the mere process of completing a local transaction with someone who happens to be engaged in interstate commerce, it is pertinent to ask: "Aren't we all?"

What telephone company, however small, does not serve a local post office? Would a hotel become interstate commerce simply because its guests are generally interstate transients? Even the humblest bootblack might thus find himself engaged in interstate commerce by shining the shoes of a railroad conductor.

The whole theory seems to follow the tenuous reasoning of the nursery tale about the House That Jack Built. It will be interesting to see if the U. S. Supreme Court will go that far. And don't confuse this doctrine endorsed by the Circuit Court with the rule laid down by Chief Justice Hughes in the steel case (Jones & Laughlin case decided last spring), even though Judge Swann cited the steel case as supporting authority.

In the steel case, the Supreme Court held that where continuous local processes of the *same organization* form a commercial chain stretching across state lines, an interstate commerce status results. Thus regarded was a steel company having mines in the Dakotas, smelters and steel mills in Ohio and Pennsylvania, and sales organization in New York.

Judge Swann's opinion obviously goes much further and suggests that even if the local processes were conducted by independent local companies that happened to deal at arm's length with one another, the continuous chain of interstate commerce would still result.

THE DIFFERENCES of Chairman Arthur E. Morgan with his colleagues on the TVA directorate may inspire some general interest in this forthright man whose open defiance of President Roosevelt has the nation buzzing. Glancing through some file material, your correspondent came across the following passage from the pen of Dr. Morgan which may interest telephone men. It is taken from a piece called "Sky Hooks" and was published in Antioch Notes for January, 1933, a college publication of Antioch (Ohio) College, of which Dr. Morgan was the president:

> We live so much through the service of public utilities that whoever controls them largely controls our lives. Europe turns to public ownership for protection. America would like to preserve the creative impulse and economy of private control, but unless in private control there is a degree of integrity and sense of trusteeship far beyond that required for small-scale business, or unless people are "educated" to docility by the utilities, the public may be forced to take over the utilities in self-protection. *Organizations like the American Telephone & Telegraph Co. by the honesty of their methods do much to create public confidence in the management of affairs.* (Italics supplied.)

WE MAY HEAR repercussions in Congress if the FCC supports the recommendation of its Examiner R. H. Hyde that the Mackay Radio & Telegraph Co. be denied authority to extend its service to Rome. And from the present outlook it is likely that the FCC will do that very thing.

The Mackay interests filed a petition in May, 1936, asking that the FCC modify existing licenses already given for point-to-point communication services between New York and Rome, the objective being to establish a Mackay radio-telegraph communication circuit between the United States and Rome.

The examiner's report followed the expected line to the effect that existing service is adequate and that the traffic is not sufficient to support a duplicate service. Coming so soon after somewhat similar trouble about establishing a new circuit to Oslo, Norway, there may be some more talk about the FCC fostering monopoly in the radio communications field, even though it is difficult, from the facts assembled by Examiner Hyde, to see how the FCC could have decided the question differently.

The Oslo case, it may be recalled, provoked some anti-monopolistic comment in Congress. But the FCC is up against the dilemma of allowing duplicate competition just for competition's sake, or preventing by decisive action at this point, the radio communications business from getting into the same trouble which the telephone companies formerly had.

SOME little surprise was occasioned among regular observers of the activities of the FCC by the alignment of the vote on Commissioner Craven's original motion to take up his resolution to investigate

DO'S AND DON'TS

By MISS ANNE BARNES

Traveling Chief Operator, Iowa Independent Telephone Association, Des Moines, Iowa

IT WAS THE SECOND DAY of Mary Jones' training on the Hocum switchboard. She was a little fearful as she came into the operating room and took her chair beside Hetty Stone. Fearful of Hetty, fearful of making mistakes, and fearful that she would forget some of the do's and don'ts that were contrary to the routines Hetty had given her to study.

She had grasped the idea of answering and disposing of calls that didn't meet up with a do or don't but these were always bobbing up when least expected and she could only follow blindly Hetty's orders. For instance, a call came in for 73; Hetty told her to connect and ring on 197 because something was wrong with the 73 jack. Then added, "You just have to remember that." That was only one of many things Mary had to "just remember."

"I don't see how you *can* remember so many things—who can talk on toll without an okay and who cannot, the firemen's numbers and all that," said Mary.

"It takes time," said Hetty. "When I first came here to work eleven years ago there was an old board. Learning to operate it would have been a slow process but the operator who taught me had used different colored paint markings on the drops to designate various things; also overhead bulletins which were a great help to a new operator. But it was a lot of trouble to keep bulletins and markings up-to-date, especially after we had learned things so that we did not have to look at the bulletins and designations often. So when the new board was installed we decided to do away with those things and depend on memory."

"But what if you don't always remember things," said Mary, "particularly during rush hours when calls pour in?"

"Well, if you don't remember, it's just too bad!" Hetty told her.

If there must be do's and don'ts, the designation signs should be a permanent fixture and should also be included in a student's training routines.

I am reminded of a story of a tourist who said to her guide, a native: "There appears to be a very dangerous precipice just ahead of us. What if one did not see it in time and fell over? There should be a warning sign to prevent accidents."

"Well," said the guide, "we generally tell tourists about the precipice before we come to it. There used to be a sign here, but no one ever fell over so it was taken down."

the radio industry. This was the real test of whether there was to be any investigation at all at this time.

The subsequent adoption by a 6 to 1 vote of Chairman McNinch's alternative resolution was a mere compromise by which the full commission was let in on the show instead of confining it to Commissioners Walker, Payne, and Craven, as Mr. Craven's original resolution would have had it.

Note now the vote on this preliminary skirmish. On Mr. Craven's side were Commissioners Payne, Walker, and Brown. On the other side were Chairman McNinch, Case, and Sykes. We can assume that those voting with Chairman McNinch were following the "administration line" (such as it is), which may explain the position of Mr. Case, whose term of office expires next July.

There are several angles concerning the radio broadcasting industry which the old-line administration supporters are resolved should not be explored by this investigation, and Chairman McNinch may yet succeed in keeping the commission investigation out of forbidden closets, but it must be conceded that Commissioner Craven has won the first toss for what it is worth.

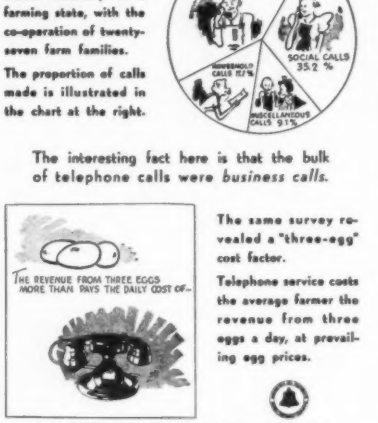
THE FCC ORDER, as first adopted, outlined the scope of the radio inquiry so as to include the contractual rights and obligations of stations engaged in chain broadcasting, arising out of their network agreements.

The extent of the control of programs and advertising contracts exercised by stations engaged in chain broadcasting will be studied, as will be the nature and extent of network program duplication by stations serving the same area.

Also included will be contracts providing for exclusive affiliation with a single network; a survey of the extent to which single chains or networks have exclusive coverage in any area; the program policies adopted by the national and regional networks, and the nature of service rendered by stations licensed to chains.

The number and location of stations affiliated with the networks and the number of hours used by the networks will constitute another phase. Another will deal with the rights and obligations, as far as advertisers are concerned, of stations engaged in chain broadcasting.

The sections of the order dealing with monopoly directed that the inquiry cover:


ON THE FARM . . .
Nearly Half the Number of Telephone Calls Are BUSINESS CALLS
A survey of telephone calls on farm lines was made recently in a farming state, with the co-operation of twenty-seven farm families.
The proportion of calls made is illustrated in the chart at the right.
BUSINESS CALLS 46.6 %
SOCIAL CALLS 35.2 %
HOUSEHOLD CALLS 12.1%
MISCELLANEOUS CALLS 9.1%
The interesting fact here is that the bulk of telephone calls were business calls.
THE REVENUE FROM THREE EGGS MORE THAN PAYS THE DAILY COST OF—
The same survey revealed a "three-egg" cost factor.
Telephone service costs the average farmer the revenue from three eggs a day, at prevailing egg prices.
SOUTHWESTERN BELL TELEPHONE COMPANY

Advertising copy used by the Southwestern Bell Telephone Co. in the Missouri Farmer of March 15, suggested by an article which appeared in TELEPHONY February 19, in the company's educational campaign to increase the farmer's appreciation of the telephone's value.

Competitive practices of stations engaged in chain broadcasting as compared with such practices in the broadcasting industry generally.

Effect of chain broadcasting upon stations not affiliated with any network.

Practices or agreements in restraint of trade or furtherance of monopoly.

Extent and effects of concentration of control of stations in the same or affiliated interests by means of network contracts or agreements, particularly insofar as restraint of trade or monopoly results.

Mr. Payne explained his solitary dissent by stating that he still favored the resolution offered by Commissioner Craven. That resolution, for which Chairman McNinch's was substituted, also ordered an investigation of "monopolistic practices or trends," but did not list the specific points named by Mr. McNinch.

The commission's action arose from a comprehensive report which Mr. Craven made last year on the social and economic aspects of broadcasting. In offering his resolution for an investigation, Mr. Craven said:

"Recently there have been many criticisms and charges with reference to alleged shortcomings of the existing application of radio to the public. Therefore, the time has come when complete facts and data are necessary to establish the truth or falsity of such charges. This is essential in the interest of the public as well as for the stabilization of an industry which in general has rendered excellent service to the public."

P. S. Your humble correspondent's remarks some while back about the scootomobile dial telephone appears to have unloosed upon his head well deserved nominations for the post of "Rip Van Winkle of Washington." Seems that right here in the nation's capital the local Bell company distributes a handsome heavyweight dial set.

As for the Independent manufacturers, imagine this writer's embarrassment to learn that nearly all of them have been making guaranteed non-scooters for a number of years. Scoot-proof models, it appears, go back ten years or more. Now that that's settled, will anyone be so kind as to inform this department who won the San Francisco earthquake?

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Officers Elected of Indiana Organization

Ben C. Schweitzer, commercial superintendent of the Home Telephone & Telegraph Co., Fort Wayne, Ind., recently was elected secretary-treasurer of the Northeastern Indiana Telephone Association, an organization comprising 75 exchanges. The convention was held in Fort Wayne. Eugene Kelly, manager of the Waterloo Telephone Co., was elected president and John Carson, manager of the Angola Telephone Co., was named vice-president.

Conferences were held during the convention under the supervision of W. T. E. Ehinger, commercial; Frank J. Baker, general plant superintendent of the Home company, plant, and Miss Louise Pohlmeyer, chief operator of the Fort Wayne company, who discussed traffic conditions.

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Telephone, Yanked Off Wall, Signals Operator

Miss Marjorie Philson, night operator at York, Neb., for the Lincoln Telephone & Telegraph Co., has brought grief to those dramatists who construct thrillers on the theory that tearing a telephone off the wall by marauding gangsters leaves their victims without hope of gaining outside aid.

Recently when two bandits held up a filling station on the edge of York they yanked the telephone off the wall. But instead of isolating the station they rang a signal in the exchange switchboard, and when Miss Philson answered it she heard cries and calls that gave her a clue to what was going on. She summoned the police, and the robbers were later captured.

Inductive Interference Cases, Involving REA, Before Commissions

Arkansas Association in Interference Hearing

Another of the long list of hearings before state commissions on inductive interference between grounded telephone lines and rural (REA) power lines was held before the Arkansas Department of Public Utilities on March 11 and 12. This particular hearing was held for the purpose of collecting data on the inductive effects likely to be experienced by grounded telephone lines involved in parallels, so that the commission could prepare a general order covering this matter.

The Arkansas Telephone Association was ably represented by Attorney C. B. Thweatt of Little Rock. B. C. Burden, transmission engineer of the Lincoln (Neb.) Telephone & Telegraph Co., appeared for the association as an expert witness and assisted in the cross-examination of power engineers. The power arguments were presented by counsel representing the REA and the Arkansas Light & Power Co.

At the beginning of the hearing the counsel for the power interests contended that the Arkansas commission has no jurisdiction in the matter of prescribing damages to compensate for service interruption resulting from inductive interference. The association argued that the commission does have the power to decide what public convenience and necessity require in the matter of terms and conditions that should be included in the certificate, franchise and contract that the department grants to the constructors of a power line.

Numerous cases in point were cited to substantiate this contention. The fact that utilities commissions in the states of Minnesota, Iowa, Nebraska, North Dakota, Oklahoma and Wisconsin have held that they had jurisdiction to make rules and regulations which require the power companies to share the cost of eliminating inductive interference on paralleled grounded telephone lines was offered as evidence supporting the Arkansas association's contention that the state commission has jurisdiction in such matters.

In answer to this, the Arkansas Light & Power Co.'s counsel contended that injury can only be handled through the courts and not by the department which is a legislative and not a judicial body. The commissioners, after a short recess, reported that in their combined opinion they did have jurisdiction in this matter.

The telephone association then started its argument by testimony of B. C. Burden, transmission engineer, who, after being qualified as an expert on inductive matters, was questioned at considerable length on the matter of inductive interference and its possible effect on rural grounded telephone lines in Arkansas.

This testimony developed three points: (1) That in virtually all cases grounded telephone lines, if paralleled by the proposed power lines, would need to be metallicized; (2) that the power company had selected a type of power line which had high inductive influence but which had compensating advantages, such as lower first and maintenance costs and greater safety from a physical standpoint; (3) that the grounded rural telephone lines now in use in many sections of the state were adequate and satisfactory for the type of communities which they serve.

Following the direct testimony the power interests endeavored unsuccessfully to refute the testimony presented. Mr. Burden was followed on the stand by Curtis Stout, secretary of the association, who testified that in his opinion rural service would have to be abandoned in many sections of the state if the smaller telephone companies were compelled to metallicize their lines at their own expense. He estimated that there were approximately 7,000 lines of the so-called "farmer service" type.

Can Farmer Afford Electric Service If Not a Telephone?

His testimony developed the statement that people, in many instances, were taking power service and ordering out telephones. One of the commissioners at this point asked: "How can the farmer pay for electric service if he cannot stand the increased cost of telephone service?" No satisfactory answer was forthcoming to this more or less general question.

S. A. Lane, president of the telephone association, next testified regarding the effect of proposed rural lines on the lines of his company. He brought out that many of his rural lines were not profitable, and increased rates would be required in the event of metallicization.

The power company's attorney at this point asked: "Into whose rate base will increased capital charges of metallic lines go if material is furnished by the power company?" No answer was received to this question, although someone humorously replied, "both."

A representative of the Oklahoma Gas & Electric Co. next proposed that power and telephone relationships can best be settled by joint committees. He suggested that such a committee be organized to discuss and work out a practical solution of the matter before the commission.

The Arkansas Light & Power Co. was willing to take part in such committee work, but the REA representative stated that he had not been authorized by Washington headquarters to commit the REA to any new and different policy. Its present stand was that they *would pay none of the costs* to correct inductive interference.

The question was raised as to what had been done in other states in which commissions had issued orders requiring the REA to assume the costs of metallicizing telephone lines. The REA representative stated that in all cases where construction had gone ahead, and particularly in Iowa, releases had been obtained from the telephone companies involved.

The chairman of the Arkansas commission commented that these releases were probably of the "shotgun" type in which pressure was brought to bear on former telephone subscribers who are at this time more interested in power service than in telephone service.

Cross-examination of witnesses by Attorney Tweatt and Engineer Burden developed that the witnesses had in no case measured the noise; nor were they thoroughly familiar with the circuit setup and other features of the "noiseless" parallels, which they were citing as examples, and that their testimony was based on opinions rather than facts.

Following this testimony a telephone subscriber on a grounded telephone line was introduced as a witness for the power company. His testimony brought out the fact that he was secretary of one of the co-operative electric companies. He testified that electric service meant more to him than telephone service, although he did value his telephone.

The last witness presented was an engineer for the Oklahoma Gas & Electric Co., who testified that the safety features inherent to the multi-grounded "wye" type line more than justified its use but that in his experience this type of line would produce considerably more

interference than would the well-balanced delta type line. He also testified that his company made a practice of taking care of the material costs of metallicizing rural grounded lines which their new construction might parallel and that the cost of this amounted to approximately $20 per mile.

This testimony concluded the hearing and the commission promised that the decision and general order would be forthcoming within a few weeks.

The showing made by the telephone association was gratifying and it was felt that a favorable decision would be rendered in this case. In a final statement by the REA attorney, it was indicated that the REA policy would be to use the money which has been set aside for certain Arkansas projects for other projects so that any adverse decision would deprive the communities involved of electric service.

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Oklahoma Companies Claim Highway Rights Over REA

A direct clash between federally-backed farmers' cooperatives, constructing rural electric power lines in Oklahoma, and Independent telephone companies which own grounded return telephone lines, was involved in the hearing of complaints of four telephone companies before the Oklahoma Corporation Commission on March 17.

The telephone companies complain that the farmers' cooperatives have completed and are constructing power lines, with the aid of the REA, along highways now occupied by rural telephone lines and are refusing to furnish materials to enable the telephone companies to make their lines metallic and eliminate inductive interference.

The telephone companies claim that they are the only utilities in Oklahoma which were given the right to construct lines on or along public highways without special permission of the states; that they occupied these highways first and that the farmers' cooperatives have no right to construct lines over or paralleling existing telephone lines and thus destroy, or greatly reduce, their efficiency.

The commission was asked by the telephone companies, represented at the hearing, to enforce its order No. 11795, amending its former order No. 1946, which requires power companies to furnish material for making telephone lines metallic along sections where parallel or overhead electric lines set up inductive interference.

The farmers' electric cooperatives, through their attorney, Peyton Brown, of Blackwell, challenged the jurisdiction of the state commission. Mr. Brown contended that the farmers' cooperatives are non-profit corporations, and, if they were compelled to pay the cost of metallizing the grounded telephone lines, the rural electrification program now being carried out in many sections of Oklahoma and in other states will be seriously hampered if not entirely blocked.

He declared that no money is available for metallicizing telephone lines. He did promise, however, that the cooperative he directly represented in the hearing would move poles to the opposite side of the highway where its power lines over-passed the telephone lines and caused interference.

Attorney Brown refused to concede that the telephone companies had prior rights to the highways they occupied and contended that the principle of the common welfare, or the greatest public interest, should govern. He claimed that the farmers' rural electric lines will serve at least twice as many patrons as the telephone lines involved.

The REA attorney also contended that the farmers' electric lines are being constructed according to modern approved standards and that if the telephone companies would metallicize their lines the interference would be reduced 99 per cent. He declared that the REA attorneys, at the hearings on the commission order No. 11795, did not agree to the inductive interference damage rules in that order.

The telephone companies, represented at the hearing by E. S. Ratliff, Oklahoma City attorney, requested that the commission enforce the order against the REA-backed cooperatives, that more than 100,000 telephone subscribers in Oklahoma are being, or will soon be, deprived of adequate telephone service by the cooperatives' electric lines and that the cooperatives are doing nothing to compensate the telephone companies for the great damage to their service.

For purposes of the hearing, the complaint of the Southwest Telephone Co. (Cause No. 17299), and the complaint of the Southwestern States Telephone Co. (Cause No. 17300), both against the Oklahoma Inter-county Electric Cooperative operating in Cleveland, Blaine and Grady counties, were made the basis of the arguments.

It was agreed that the issues involved also applied to Cause No. 17273, Mutual Telephone Co. of Okeene, vs. the Consumers Rural Electric Co. of Kingfisher, where the electric lines already have been energized, and Cause No. 17313, North Union Telephone Co., of Burlington, vs. the Alfalfa County Electric Cooperative, of Cherokee.

Following the arguments, the REA attorneys representing the cooperatives, asked that the corporation commission refuse to take jurisdiction and dismiss the proceedings. The commission took the matter under advisement, giving attorneys 20 days to complete filing of briefs. After the commission rules on that question, it is likely that the losing side will take an appeal to the Oklahoma Supreme Court for a writ of prohibition.

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Power Project Liable for Damage to Farm Lands

Of interest to wire companies is the recent decision of the Nebraska Supreme Court, in which, passing upon the question for the first time, it held the Platte Valley Public Power District liable for damages where its construction is of such a type as to create a special danger for farmers across whose farms its lines are built. The court says that where a farmer can show that his lands will sell for less now than before the line construction there should be a proper measure of damages by reason of their operation.

Claiming that construction across farms and highways of transmission lines in connection with electric energy service is not potentially any more dangerous than that of telephone and telegraph companies, the Platte Valley Public Power District had asked the Nebraska Supreme Court to set aside a judgment for $3500 allowed by the jury which tried a case for damages instituted by a Hamilton County farmer.

Attorneys for the district, which has been financed to the extent of 12 million dollars by government loans and grants and is nearly ready to operate, claimed that fear is not a proper element of damage when the value of farm lands is considered. However, the court below held that with so many wires now crossing Nebraska farms, representing all sorts of wire service, many of them look more like manufacturing plants than like farms.

It was stated that where the chief engineer of construction had issued warnings as to the deadly character of the current carried on the heavy transmission lines he had established the fact that fear enters the problem, and that this fear might easily lessen the value of a man's farm when offered for sale.

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Ask Rural Rate Increase Due to REA Interference

D. E. McGregor, of Gibbon, Neb., president of the Nebraska Central Telephone Co. and president of the Nebraska Telephone Association, boldly met the issue of higher telephone rates caused by the widespread construction of rural electrification lines in Nebraska by filing with the Nebraska State Railway Commission an application adding 50 cents a month to the present

MINNESOTA COMMISSION ENDORSES AMENDMENT TO REA ACT

A LETTER SIGNED by H. R. Atwood, as chairman of the Minnesota Railroad & Warehouse Commission, has been sent to Minnesota's two U. S. Senators and its nine representatives in Congress, expressing the commission's endorsement of the bill advocated by the Independent telephone companies amending the REA act and urging the support of the Minnesota congressional members. Enclosed with the letter was the following resolution adopted by the Minnesota commission:

"It having come to the attention of the Minnesota Railroad & Warehouse Commission that there has been introduced in the Congress of the United States, a bill S. 3456, H. R. 9548, to amend section 904 of the Rural Electrification Act approved May 20, 1936, (U.S.C. Supp. III, Title 7, ch. 31, p. 70), and

Whereas, said bill, if enacted, will conform to the laws of Minnesota and the rules, regulations and specifications of this commission, pertaining to situations where electric lines cross or more or less parallel existing telephone lines.

Therefore, Be It Resolved: That the Minnesota Railroad & Warehouse Commission earnestly recommends the passage of S. 3456, H. R. 9548, and that copy of this resolution be sent to each of our Senators and Members of Congress urging their diligent support."

The letter accompanying the resolution, adopted by the Minnesota commission and urging the Minnesota delegation in Congress to support the amendment, appears in full:

"At a recent meeting of this commission, the resolution attached hereto, recommending for passage the bill introduced by Congressman Morgan Sanders of Texas, known as S. 3456, H. R. 9548, was adopted.

The present policy of the Rural Electrification Administration in ignoring the ground return telephone line is in direct conflict with the laws of Minnesota and the rules and regulations of this commission, resulting in the placing of a heavy burden upon the 45,000 members of cooperative and mutual telephone associations in the state. If these associations are required to bear the entire cost of coordinating their telephone lines with the power lines, it may result in the abandonment of a much-needed service that has taken years to build up.

On behalf of these farmers we urge your support of the bill.

Any data in our files, pertaining to this subject, which will be helpful to you, will be promptly furnished upon request.

Yours very truly,
By The Commission,
(Signed) H. R. ATWOOD,
Chairman."

The letter, under date of March 18, was sent to Senators Henrik Shipstead and Ernest Lundeen and to the nine Minnesota representatives as follows: August H. Andresen, 1st district; Elmer J. Ryan, 2nd district; Henry G. Teigan, 3rd district; Melvin J. Maas, 4th district; Dewey W. Johnson, 5th district; Harold Knutson, 6th district; Paul J. Kvale, 7th district; John G. Bernard, 8th district, and R. T. Buckler, 9th district.

gross farm business rate of $2.25 and to the farm residence rate of $1.75. He also asked that rates on the seven metallicized rural subscriber lines be raised from $1.90 to $2.25.

Mr. McGregor requested the commission to hold a hearing on his application on April 7, the same day that the newly-organized Buffalo County Public Power District is to have a hearing on its request for authority to construct 114 miles of rural lines, its plans contemplating numerous parallels of the existing telephone lines of the Nebraska Central company.

This is the first application of its kind, protesting telephone companies in the past being content with asking that the federal Rural Electrical Administration contribute at least the cost of materials in substituting metallic for grounded service and that they be required to observe the national standards code of construction at crossings.

Mr. McGregor told the commission that if the plans of the public power project are approved it will mean that all of his rural lines will have to be metallicized.

One unusual feature in this electric construction is that many farmers supplement nature by sinking wells operated by electric pumps. The motors on these consume so much current that an unusually heavy load will be carried on the district transmission lines, making inductive interference so great that grounded telephone lines cannot be satisfactorily operated at any time. Mr. McGregor said this meant higher maintenance costs, as lines will have to be made as efficient as toll lines.

▼ ▼

Trucking Problems Over-Shadow Telephone Cases

Activities of the Nebraska State Railway Commission for the last eight months have been confined largely to preparation and later to promulgation of rate schedules and other regulatory orders covering trucking operations.

About the only attention paid to telephone corporations and their regulation has been that by Commission Accountant John H. Schnell, who has been busy for weeks going through the accounts of the Wayne, Neb., exchange of the Northwestern Bell Telephone Co. in connection with a complaint filed by C. H. Hendrickson, a local attorney, that rates are excessive.

The new motor truck schedule is largely the product of the new commissioner, F. A. Good. He has championed it and the base used, airline mileage, whenever assailed, with much fervor. It has, however, been so vigorously objected to that the commission has suspended the new rates as applied to the principal commodities handled—dairy and poultry products, hay, fresh fruits, vegetables, and livestock—until a further investigation.

The truckers and affected interests contend that the minimum rates fixed make short haul rates so high that the business will either go to the railroads or the large corporations that operate creameries and do business as egg and poultry handlers, will operate their own trucks.

To add to the troubles of the commission, hot criticism has been brought from members of the legislature because of a recent commission order in which it reached out to take over control and supervision of operations of farm trucks used for hire, which includes a lot of trucks used by owners to haul for truckless neighbors.

The legislature specifically exempted these trucks, but the railway commission says that, as the constitution gives the commission control over all common carriers for hire, the legislature is without power to make any exemptions.

Toll Rate Structure— Basic Rate Practices

EXCERPTS FROM fact-finding report by C. I. Wheat, of FCC telephone rate and research department, to Federal Communications Commission on the Bell System's classified toll rate structure and basic rate practices of associated companies for message toll rate service. . . . Data assembled through cooperation of Bell System officials and representatives of state regulatory bodies. This third and concluding installment takes up the classification of toll charges by hour of use and length of conversation; also a comparison of differentials in rates for various classes of service. The first and second installments appeared in the issues of March 12 and March 19

THE Bell System has adopted, generally, a standard set of rate periods for both station-to-station and person-to-person service. Day rates apply daily except Sunday between 4:30 a. m. and 7 p. m.; night rates apply on all days between 7 p. m. and 4:30 a. m., and Sunday rates, which are the same as the night rates, apply on Sundays from 4:30 a. m. to 7 p. m.

It should be recalled that the general plan of any typical physical telephone plant involves the provision of adequate facilities to meet the requirements of the busy hour of the day, or "peak period," which, with relatively few exceptions falls in the late morning or early afternoon. The classification of the hours of the rate into rate periods tends to develop the service by offering reduced rates at times when the total traffic of the system is below the daily peak and there exist consequent spare facilities.

This method of operation thus assists in securing and maintaining a more even distribution of traffic throughout the day. Of course, the rate differential must not be so great as to create a new peak during usually "off peak hours," thus getting the cart before the horse and necessitating additional plant facilities merely to take care of normally non-peak business.

A great deal of the additional business stimulated by reduced night and Sunday rates is of a purely social character and is highly susceptible to increases in volume with reductions in rates. Efficiency of operation is, therefore, promoted by the more intensive use of the telephone plant which results from the development of business that would not be obtained at all under the standard day rates.

The adoption of a broad reduced rate period commencing at 7 p. m. and lasting until 4:30 a. m. avoids the creation of new peaks that might easily be encouraged by the application of a reduced rate period starting at such a late hour as midnight. The experience of the Long Lines department with midnight rates under the so-called "Burleson Schedule," in effect between 1919 and 1926, disclosed the undesirability of a selection of hours tending to concentrate traffic within a very short space of time, which effect was also encouraged by a midnight discount of 75 per cent.

Reduced night and Sunday rates are not applicable to the shorter hauls under any of the rate schedules of the Bell Associated Companies. This is particularly attributable to the fact that operating labor is a much larger proportion of total operating expense at the shorter distances.

Moreover, a greater proportion of short haul messages is generally of a social nature and tends to be more evenly distributed among the various hours. In fact, in many residential suburban communities the busy hour of the day naturally tends to fall during the early evening period, despite the fact that reduced rates are not applicable on most such short haul messages. However, the determination of the exact mileage above which a telephone company can economically and profitably afford to offer reduced rates is an open question and, as discussed later, the practices of the Bell companies vary somewhat.

Standardization of Hours of Reduced Rate Periods

During the past two years the Bell System has brought about virtually complete standardization of the hours of reduced rate periods throughout the United States, although only a short time ago there was considerable variation among the states as to the hours of reduced rates. . . . When the study which has resulted in the present report was commenced, there were still several states with highly significant variations from the standard Bell System classification of toll service, including the absence of Sunday rates and person-to-person night rates, higher person-to-person overtime rates, and appointment and messenger rates in certain instances 50 per cent higher than the basic station-to-station day rate.

These apparent inconsistencies were called to the attention of the American Telephone & Telegraph Co. officials and have since been eliminated. Regardless of the precise cause for such greater standardization, the apparent recognition by the Bell System of the desirability of the uniformity, thus recently manifested, seems highly significant.

Among the Bell Associated Companies there is some variation with respect to the minimum reduced night and Sunday rate for each class of service. The minimum reduced rate is the lowest night and Sunday rate that is less than the corresponding day rate. The customary practice of the Bell System has been to determine the messages on which reduced rates apply by means of a minimum reduced rate rather than a given mileage above which discounts are offered. Of course, in any particular toll rate schedule the minimum reduced rate will automatically be accompanied by a mileage above which reduced rates become effective.

The most typical practice within the Bell System is to offer reduced night and Sunday rates on station-to-station messages with initial day rates above $.35 and on person-to-person messages with initial day rates above $.50. This practice is also applicable on the Long Lines.

Classification by Length of Conversation

The practice of charging for messages by the length of conversation tends to charge patrons somewhat in accord with costs of service, and also to prevent waste arising from unnecessarily long talking periods. The consumer who is not in need of a long talking period obtains the benefit of a lower rate than is otherwise obtainable, and there is a more equitable distribution of charges in relation to the amount of service furnished, as measured by length of conversation.

In general, the use of telephone facilities in relation to the patron's needs tends to promote economical operation and should be reflected in lower rates for all messages.

Measurement of Length of Conversation

In practice, length of conversation is measured by the initial period or maximum talking period under the initial rate, and by the number of overtime periods. The length of the initial and overtime periods of conversation and the method of calculating overtime charges are shown in the accompanying table. Except for very short-haul station-to-station messages, the initial period is three minutes and the overtime period one minute.

The determination of the initial period is influenced chiefly by the desire for a period not so long as to result in unfavorable revenue reactions nor so short as to result in unfavorable service reactions. The period selected by the Bell System is designed in theory to be long enough to enable the completion of a large proportion of all messages but not necessitating initial rates high enough to restrict the development of telephone service.

As a measure of the length of conversation, the three-minute initial period (plus overtime periods) is not ideal. Data from the October, 1936, Toll Analysis indicate that some 32 per cent of all Long Lines messages do not exceed 2½ minutes and roughly 45 per cent of long lines messages are not over three minutes in duration.

On each of these messages the consumer pays for three full minutes of talking time. However, although these figures indicate that the three-minute initial period is not a perfect measure of the length of conversation, it is not certain that any other given initial period would be preferable, and the three-minute period has been adopted very generally in the United States as well as in most foreign countries. This is a very good illustration of the need for some method of rate "experimentation," a "laboratory," so to speak, where various toll rate schedule problems could be tested.

In addition to playing an important role in the control of the magnitude of and relationship between initial and overtime rates, the length of the initial period has a tendency to influence the length of the average talking period. Insofar as an increase in the initial period operates to increase the length of conversation, such increase in the use of facilities would doubtless in the long run add to operating expenses and, consequently, to the revenue requirements of the company.

Conversely, as the length of the initial period is increased the volume of overtime messages and, therefore, of overtime revenue would automatically decrease. Thus, the net effect of an increase in the initial period is apparently high initial rates and low overtime rates, tending to restrict the development of the service by limiting the demand of many patrons with short conversation needs or those who do not use the toll service until rates fall below some maximum figure. Further study of this problem seems highly desirable.

Alleged potential unfavorable service reaction to a shorter initial period seems to be much weaker than the case against a longer period. Although the service value of a message of two minutes may generally be less than one of three minutes, it should be borne in mind that over 30 per cent of all long lines messages are completed within 2½ minutes.

If the initial rate under a shorter period were to be subjected to a substantial measure of reduction, it might well be argued that there would be a tendency to promote the extension of the toll service to a greater cross-section of the public. However, the exact extent of reduction that telephone carriers could practically afford to offer the public

(*Concluded on page* 24)

Length of initial and overtime period of conversation and amount of overtime charges January 15, 1938.

(Long Lines and each of the Associated Bell Companies follow the basic practice indicated below with respect to initial and overtime periods and the relationship between initial and overtime rates, with some specific exceptions.)

Class of Service	Initial Period Rate	Initial Period	Overtime Period	Rate Per Overtime Period
Station-to-Station	$ .05	5 minutes	5 minutes	$ .05
	.10	5 minutes	3 minutes	.05
	.15	5 minutes	2 minutes	.05
	.20	5 minutes	2 minutes	.05
	.25	5 minutes	1 minute	.05
	.30 and over	3 minutes	1 minute	(A)

Person-to-Person		First 3 Overtime Periods	After 3 Overtime Periods
$ .15	3 minutes	1 minute	$ .05	$ .05
.20	3 minutes	1 minute	.05	.05
.25	3 minutes	1 minute	.05	.05
.30	3 minutes	1 minute	.10	.05
Over	3 minutes	1 minute	(B)	(C)

Notes: (A) One-third of the initial period rate computed to the even or next lower multiple of $.05 where the initial rate is less than $3 and to the even or next lower multiple of $.25 where the initial rate is $3 or more.

(B) One-third of the initial person-to-person rate computed as in Note (A) above.

(C) In general, same as the overtime rates for the corresponding day, night or Sunday station-to-station services at the same mileage steps.

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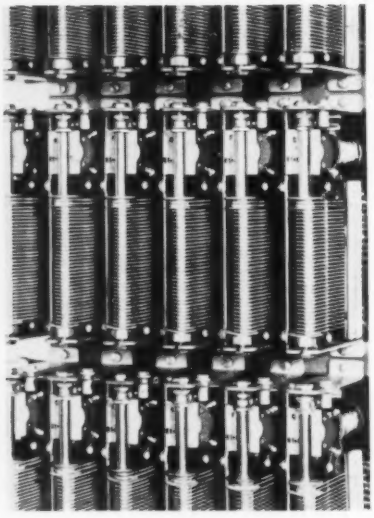

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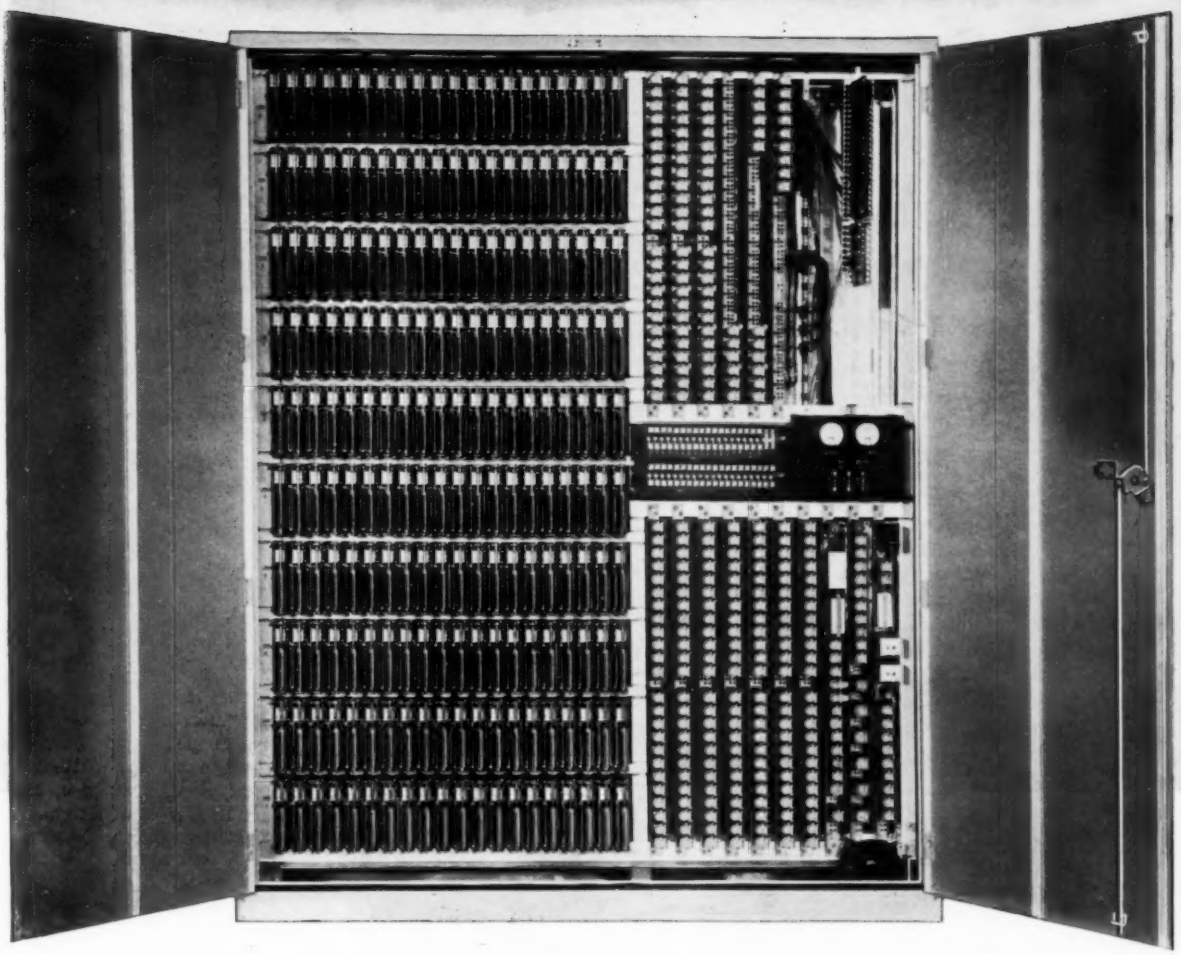

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(*Concluded from page* 21)
under a shorter initial period has been and still remains an open question.

The Bell System's present practice is to maintain the overtime rate for one minute at approximately one-third of the three-minute initial period rate. The apparent reasonableness of this practice may be questioned, since the costs of establishing the connection are not affected by length of conversation, and only the remaining costs vary (somewhat roughly) in proportion to the duration of the conversation. The question becomes one as to whether the rate per overtime minute should not be fixed at less than one-third of the initial period rate.

It may, of course, be said in favor of maintaining relatively high overtime rates that this renders possible lower initial period rates, and thereby a larger number of patrons are enabled to use the service. Moreover, if overtime charges were reduced to a point sufficiently low in relation to initial charges, waste of service and uneconomical operation might ensue, as in the case of a flat rate per message regardless of the talking period.

The question of the most desirable relationship between person-to-person initial and overtime rates is more complicated than that involved in station-to-station service. The present practice of Long Lines and most of the Bell Associated companies is to establish the person-to-person overtime rate per minute for the first three overtime minutes as one-third of the initial period person-to-person rate and to apply the corresponding (lower) station-to-station overtime rate for additional minutes of conversation.

Justification for the application of higher charges for person-to-person overtime than for station-to-station overtime periods must apparently rest upon a belief that the differential between the initial period charges for the two classes of service is not, in itself, sufficient to cover the extra costs of person-to-person messages. Since these extra costs of person-to-person messages are for the most part incidental to the initial completion of the call, it would seem logical for such extra costs to be covered in the initial period rate, and for all overtime rates to be made the same as for station-to-station calls.

Obviously, this question is one of importance to the regulatory bodies, and further investigation is needed to determine whether the initial period differentials do, in fact, cover the extra costs of person-to-person service; and, if not, whether it is reasonable to assess a portion of such costs applicable to initial period users against customers who use the overtime service.

Such a study will involve a consideration of what factors, if any, other than mere cost should be given weight in solving this problem. Cooperation between regulatory bodies, both state and federal, and the telephone companies is essential to the solution of this, as well as of the many other rate-making questions posed in this report.

Variations in Length of Talking Periods

The length of the initial and overtime periods for message toll telephone service, as indicated in the accompanying table, has been standardized throughout the entire Bell System, with the exception of the area served by the New England Telephone & Telegraph Co. On intrastate business in Maine, New Hampshire, Vermont, Massachusetts and Rhode Island and on interstate business between any two of the aforementioned states, where the initial station-to-station rate is $.15, $.20 or $.25, the initial period is three minutes and the overtime period is one minute.

Under the standard practice followed in all other states, where the initial station-to-station rate is $.15 or $.20, the initial period is five minutes and the overtime period two minutes; where the initial station-to-station rate is $.25, the initial and overtime periods are five minutes and one minute, respectively. The variation on the system of the New England company thus results in higher charges for messages of longer duration than three minutes.

Variations in Person-to-Person Overtime

For all person-to-person messages over the Bell System, the initial period is three minutes and the overtime period one minute. The overtime rate for the first three overtime minutes of all person-to-person messages is one-third of the initial person-to-person rate. However, after the first three overtime minutes (or six minutes of conversation) the practice regarding the person-to-person rate for any additional minutes varies somewhat among the several states and Bell associated companies.

The general practice of long lines and most of the associated companies is that after three overtime minutes have elapsed, the person-to-person overtime rate becomes the same as the overtime rate for the corresponding day, night or Sunday station-to-station service at the same mileage step. However, it should be noted that when the person-to-person initial rate is $.30 or less, the corresponding station-to-station overtime rate applies to an overtime period of two or more minutes, although in practice the person-to-person overtime period is one minute.

(*Concluded*)

COMING CONVENTIONS

Oklahoma Telephone Association, Huckins Hotel, Oklahoma City, March 29 and 30.

Missouri Telephone Association, Hotel Muehlebach, Kansas City, April 4 and 5.

Iowa Independent Telephone Association, Fort Des Moines Hotel, Des Moines, April 12, 13 and 14.

Nebraska Telephone Association, Hotel Paxton, Omaha, April 19 and 20.

Kansas Telephone Association, Hotel Kansan, Topeka, April 27 and 28.

Ohio Independent Telephone Association, Deshler-Wallick Hotel, Columbus, May 3, 4 and 5.

Indiana Telephone Association, Claypool Hotel, Indianapolis, May 11 and 12.

Wisconsin State Telephone Association and Wisconsin Locally Owned Telephone Group, Park Hotel, Madison, May 17, 18 and 19.

United States Independent Telephone Association: Conference of Class A and Class B Companies, Edgewater Beach Hotel, Chicago, May 25 and 26.

Pennsylvania State Telephone & Traffic Association, Yorktowne Hotel, York, June 2, 3 and 4.

New York State Telephone Association, Seneca Hotel, Rochester, June 7, 8 and 9.

Michigan Independent Telephone Association, Hotel Olds, Lansing, July 27 and 28.

The Illinois Telephone Association, Hotel Pere Marquette, Peoria, September 21, 22 and 23.

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– BECAUSE IT'S

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"Yessiree, son—that COPPERWELD wire will be there for many years because the shiny copper that you see outside is welded for keeps to a tough steel inside core. The thick copper carries the telephone talk and protects the steel from rust—the strong steel keeps the wire hanging up there when the winds are blowing and everything is loaded down with sleet." *Copperweld is the strongest telephone wire ever made.*

COPPERWELD STEEL COMPANY
Glassport, Pa.
COPPER · BRONZE · COPPERWELD RODS, WIRE, AND STRAND

The MASTER Ringing Converter

SUB-CYCLE

Became A Recognized STANDARD For RINGING CONVERTERS By Eliminating:

- Moving Parts
- Vibrators
- Vibrating Contacts
- Vacuum Tubes
- Bearings to Be Lubricated
- Brushes and Commutators
- Trouble Caused by Frequency Fluctuations
- Radio Interference

PRICE, $45.00

Equipt with Pulsator for Biased Ringing.....$55.00

Output 20 Watts, 90 Volts Operates on 110 volt A.C.

1 MONTH FREE TRIAL

(For loads 40/50 watts, write for information about Model "C")

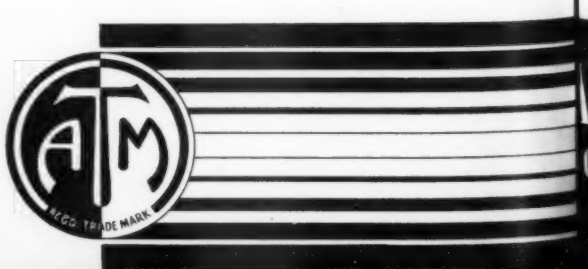
LORAIN PRODUCTS CORP. LORAIN, OHIO

Lorain Products Corporation is exclusive manufacturer for use and sale in United States. Address foreign inquiries to Automatic Electric Sales Co., Ltd., Chicago, Ill.

SOLD BY LEADING DISTRIBUTORS

THE STROWGER DIAL ROTATES WITH THE WORLD

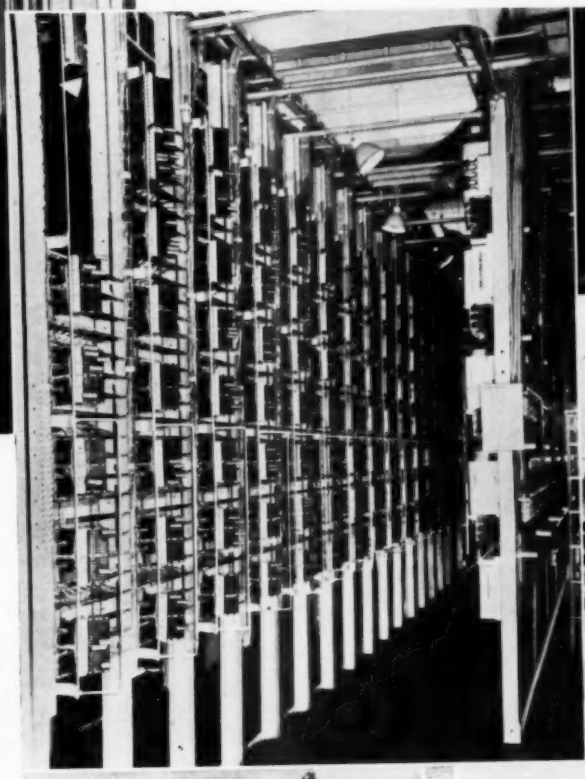
"Good-day! How are you?" . . . and, in Lisbon, two more Strowger subscribers are in touch with each other. One more conversation is being added to the millions which take place every day over Strowger telephones. It may be a weighty matter of finance or commerce discussed by business men, a talk on administration by those responsible for national or civic affairs, or merely the retailing of those tremendously important trifles which form a conversational link between families and friends separated by distance. But whatever the subject, the great majority of the world's automatic telephone conversations take place with the aid of Strowger equipment. 75% of the dial telephones of the world are Strowger and flowing through them are the languages and dialects of some seventy countries.



PORTUGAL

Norte Exchange, Lisbon, was installed in 1934 with an ultimate capacity for 10,000 lines of Strowger automatic telephone equipment. Of this total, 8,800 lines were initially installed and the excellent service provided for subscribers resulted in a further 1,200 lines of Strowger equipment being added in 1937. This extension to Norte Exchange was not the sole evidence of progress in telephone communications, for another Strowger exchange, Estrela, was also installed in 1937 and some 4,600 additional subscribers catered for in result.

Final Selector Racks, Norte.



Meter Rack, Norte.

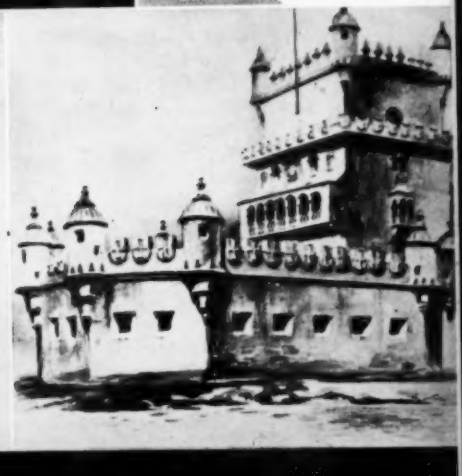
The cloisters of Jerónimos, a beautiful ecclesiastical building in Lisbon.

The Tower of Belem, Lisbon, built in 1520 to protect shipping.

(Left) The Praça do Commercio and bronze statue of Joseph Ist, Lisbon.

Portugal is a country of charm and color . . . a land where deep blue skies blend with the soft green of trees and fields to form a rich background for erce grandeur of Moorish castles, the ornate y of Renaissance churches, and the simpler but y picturesque allurement of villages of clustering houses. In the 15th and 16th centuries Portugal e maritime nation of the world. From the Tagus bon "where all the navies of the world may " sailed Vasco de Gama in 1479 to discover a Route to India, and that spirit has not passed. antle has descended, for in 1922 Cabral and ho departed from the same spot on their epoch- g Atlantic flight.

tugal has a proud history . . . and she is adding an impressive record of modern achievement.



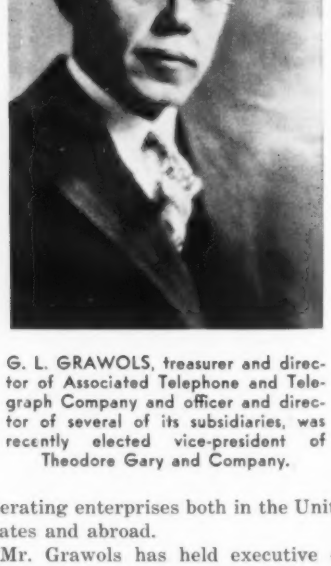
AUTOMATIC TELEPHONE & ELECTRIC CO. LTD.

NORFOLK HOUSE, NORFOLK ST., STRAND, LONDON W.C.2. ENGLAND.

STROWGER WORKS, LIVERPOOL 7, ENGLAND.

New Vice-President Of Theodore Gary and Company

G. L. GRAWOLS, treasurer and director of Associated Telephone and Telegraph Company and officer and director of several of its subsidiaries, was recently elected vice-president of Theodore Gary and Company, whose interests include extensive telephone and electrical manufacturing plants and telephone operating enterprises both in the United States and abroad.



G. L. GRAWOLS, treasurer and director of Associated Telephone and Telegraph Company and officer and director of several of its subsidiaries, was recently elected vice-president of Theodore Gary and Company.

Mr. Grawols has held executive offices in various companies of the Gary group since 1928, and during that time has been engaged largely in accounting matters and corporate organization and finance. In his new position as vice-president of Theodore Gary and Company, Mr. Grawols will maintain the closest possible contact with the group's activities.

Born in 1892, Mr. Grawols was educated at Hillsdale College where he received his B. A. degree. During later years, he supplemented this training with post graduate studies at the University of Michigan and Northwestern University, where he specialized in accounting, business administration and business law.

During 1917 to 1919, he served in various departments of the United States Navy, both at the Great Lakes station and at the Bureau of Supplies and Accounts in Washington. Subsequent to returning to civil life in 1919, he entered the employ of Arthur Andersen and company, well-known Chicago firm of public accountants. In 1921, he received his certified public accountant's degree in Illinois.

When Mr. Grawols joined the Theodore Gary and Company group in July, 1928, he became secretary-treasurer, and later vice-president and treasurer of Associated Telephone and Telegraph Company. In addition he has held and still holds offices and directorships in various of the leading companies in the group.

At the present time, in addition to this recent appointment as vice-president of Theodore Gary and Company, he is treasurer and director of Associated Telephone and Telegraph Company and of Automatic Electric Company, director of Pan-American Telephone and Telegraph Company, and comptroller and director of several companies subsidiary to Associated Telephone and Telegraph Company.

Other officers of Theodore Gary and Company include E. C. Blomeyer, vice-president; H. L. Gary, president, and A. F. Adams, chairman.

▼ ▼

Wisconsin Farmers Not "Sold" on Telephone's Value

Although 63 per cent more farmers became customers of electric companies in Wisconsin between 1927 and 1936, the number of rural telephone subscribers decreased nearly 27 per cent, statistics of the Wisconsin Public Service Commission, recently made public, show.

The drop in rural telephone service began after 1929 when the depression commenced. The decrease in 1932 alone was 21 per cent. Recovery from the low point has been slow.

Among explanations for the fewer rural telephones are increased highway and radio facilities, leading farmers to believe telephones less important.

Looking Back Into History

BELL Company Loses Berliner Patent Suit

ONE of the most important court decisions affecting the telephone industry—invalidating the Berliner patent controlled by the American Bell Telephone Co.—was recorded in TELEPHONY of March, 1901. The patent granted to Emile Berliner in November, 1891, more than 13 years after its application had been filed (June 4, 1877) was declared invalid by Judge Arthur L. Brown in the U. S. Circuit Court at Boston, Mass., on February 27, 1901.

Excerpts from the editorial commenting upon this momentous decision follow:

"The court dismissed the two suits in equity by the American Bell Telephone Co. against the Century Telephone Co. and the National Telephone Co., all of Boston. These suits were begun several years ago and asked for injunctions restraining the defendants from using carbon transmitters and are distinct and separate from the 'government suits' on the Berliner patent, which were tried in the same U. S. Circuit Court district.

The suits decided by Judge Brown were strictly on their merits and the sweeping decision, declaring the patent invalid for not only one but several reasons, is a victory for the Independent telephone public of far-reaching effect. . .

Many Independent telephone systems will now be enabled to float bonds or stocks, which heretofore would not have been possible, by reason of the fear among capitalists of this bugbear patent. It is of the greatest interest to Independent telephone interests that this Berliner patent has been so thoroughly and clearly disposed of. . . . The Associated Press dispatch and newspaper statements have intimated that the Bell company would appeal the case to the U. S. Supreme Court." (The decision was appealed but was sustained by the U. S. Circuit Court of Appeals, January 16, 1903—see TELEPHONY of February, 1903).

The successful outcome of this case was accredited to the Independent tele-

phone manufacturers in the early days, who furnished the funds with which to fight the suit.

Excerpts from the original decision in the Berliner case are presented in TELEPHONY of March, 1901, in addition to a full copy of the specifications and drawings for Emile Berliner's patent application.

This March issue also features three new telephone sets offered to the field by the North Electric Co., then of Cleveland, Ohio. One of them (the wall set) was claimed to be "the smallest complete magneto set manufactured." These telephones had concealed binding posts, self-contained switchhooks and the circuits so arranged that the wiring could be changed instantly from bridging to series or vice versa. The induction coil and switching apparatus were concealed in the base of the desk set.

The Kellogg "express" switchboard for small exchanges was also first featured in this March, 1901, issue of TELEPHONY. The article states that "it is designed with the idea of giving the subscribers of small exchanges a service that will compare favorably with that of the large multiple boards in use in large cities."

The issue also contained items relative to the following telephone conventions:

Meeting of Illinois telephone men, Champaign, February 6.

Independent Telephone Association of Michigan, Lansing, February 6.

Independent Telephone Association of Wisconsin, Madison, February 13 and 14.

▼ ▼

Police Signaling System for San Francisco Fair

The Golden Gate International Exposition at San Francisco, Calif., will be better protected against fire and burglary than any world's fair in history, it is reported, by means of a signaling system to be installed by the American District Telegraph Co. at a cost of approximately $100,000.

On "Treasure Island," the 400-acre island site for the exposition, there will be 80 miles of automatic fire alarm boxes, 50 combination fire and police alarm boxes that will also have connections for hand telephone sets which the exposition police will carry.

By means of a network of colored lights "headquarters" will be able to summon policemen to telephone boxes for instructions. In addition, there will be provided 10 watchmen-signal systems with from 3 to 15 stations each, 172 regular fire alarm boxes, two fully-equipped fire halls, a fire headquarters and a police station.

HIGHWAY

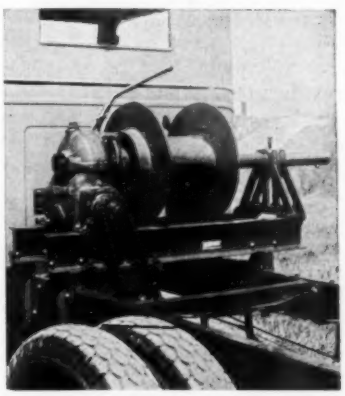
Type "LCW" Line Construction and Maintenance Body

The attractive and efficient appearance of this Highway equipment will increase the public's respect and good will for your company.

Here is a standard line construction and maintenance body that embodies the most up-to-the-minute and efficient design that has been offered to the telephone field. Every inch of space in the "LCW" Highway Body is efficiently utilized to carry the various tools and materials used by line crews.

It is light in weight, strong and durable. Outstanding features of the Highway Body are: the new "full vision" telescoping roof; the exclusive use of rust resisting galvannealed metal in the cabinets and panels; the full paneled front with enclosure between body and cab; and the "firm tread" all steel floor.

The "LCW" is a standard body . . . designed by experienced engineers who have a complete understanding of telephone company requirements.



***The* HIGHWAY WINCH**

SAVES TIME AND MONEY

Illustrated above is the highly efficient Highway Winch . . . a dependable necessity for all telephone line crews. The Highway Winch reduces the time element in line crew operations and lightens the amount of manual labor. Available in several single and double drum models.

Write today for a Highway catalog in which the complete Highway line of public utility equipment is described and illustrated.

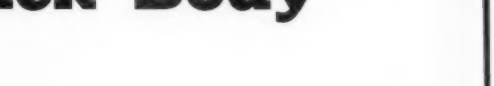
HIGHWAY TRAILER CO.
EDGERTON WISCONSIN

The Modern Line Construction Truck Body

By J. R. HOLAN

The York-Hoover Body Corporation, York, Pa.

LATEST DEVELOPMENT of construction truck correlates the body with chassis for greater efficiency. Use of steel decreases weight yet furnishes strength and flexibility. Exterior compartments for tools included in modern styling of vehicle body



THE TELEPHONE line construction truck body, after years of struggle, has moved out of the pencil and paper sketch class into the engineering room. The line construction body offers a unique problem, a problem of correlating the body with the chassis in order that the maximum efficiency may be obtained from both.

The past history of the line construction body has been that of composite construction. Most times it was just a matter of telling the mechanic what was wanted and he would proceed to build it. Later, the problem of reinforcing for winch operation strain was considered and, guessing here and there, structural shapes were bolted and welded, adding weight freely.

Today the engineer has taken the body as a whole and considered these factors: Body weight in relation to operation costs; structural strength and pay-load space; relationship of body to labor cost and fatigue; and styling. Excessive body dead-load increases operating costs and reduces the life of the chassis.

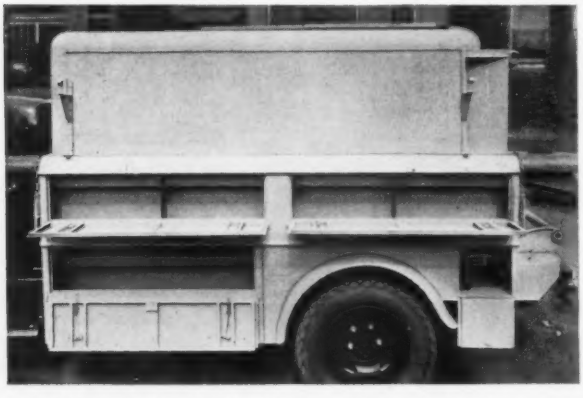
The past weight experience of medium-duty line construction bodies in composite has averaged approximately 3,800 pounds equipped, whereas the modern all-steel line construction bodies, equipped and equivalent in cubical content, weigh approximately 2,800 pounds. Thus a decrease of 26.3 per cent in the weight of the truck body has been effected.

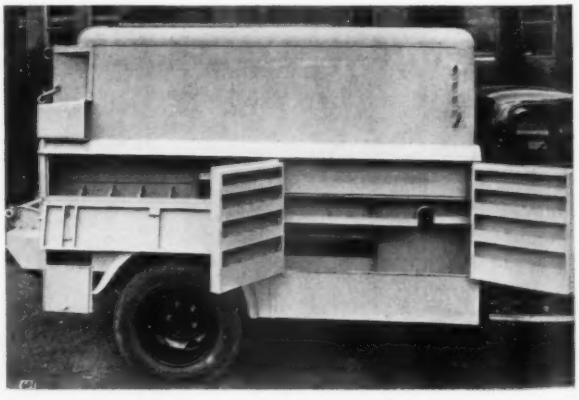
The decrease in weight has been accomplished mainly through the use of steel. The strength and flexibility which steel offers has been used in the structural design of the body. Partitions have been placed to act dually as partitions and stiffeners. The strain of winch operation is distributed throughout the body by means of one-unit, solid-welded pressed-steel base with a pressed-steel superstructure.

The exterior compartments, as well as the side panels and roof, are of light gauge sheet metal which produces a fine exterior appearance while not detracting from utility qualities.

The flexibility of steel allows the advantage of utilizing every inch of space to a useful purpose, thus making load distribution problems simpler, while increasing the cubical content of the component part of the body.

The line construction body has been studied with relation to the man in the field. Care has been taken to concentrate the most needed tools and materials into readily-accessible compartments and trays, all easily seen. An ultra-concentration has been made in the form of patented tray doors on the right side of the body. This arrange-





In designing the truck body with the worker in mind, exterior compartments and trays for tools afford excellent visibility and assist in easy inventory. Accessibility to the trays from the ground reduces fatigue, eliminating the need of men jumping in and out of the truck.

ment gives an effective, accessible, visible concentration.

Accessibility from the ground reduces fatigue, eliminating the need of men jumping in and out of the truck. Visibility assists in easy inventory, tending to prevent the accumulation of surplus or a shortage of material.

Although styling of the bodies seems superfluous from the practical standpoint, nevertheless it is with us to stay in our mode of life, and it is needless to say the public utilities will have to keep in step.

In summary the line construction body has taken its place in the engineering orbit with a definite trend towards standardization and a keynote of all-around economy.

▼ ▼

Fire Across Narrow Street; Operator Carries On

True to the spirit of service, Mrs. Robert S. Miller, operator of the Kansas Telephone Co., at Bonner Springs, Kans., remained at her post—undaunted by broken glass and the water from the fire hoses with which she was alternately sprayed—during a fire which threatened to spread throughout the business district.

After sounding the local fire alarm, Mrs. Miller summoned aid from the Kansas City, Kans., fire department and remained at her post until ordered to leave by L. F. Bender, manager of the local exchange.

The fire destroyed a garage across a narrow street from the telephone office. There were many explosions of gasoline and the heat caused the window above Mrs. Miller's switchboard to shatter.

The fire, which caused a loss of about $16,000, was prevented from spreading by an 18-inch firewall, and by the joint efforts of the Bonner Springs and the visiting fire companies which responded quickly to the summons of the local telephone operator.

▼ ▼

Honored by Business Men for Service Efforts

From time to time there are evidences that subscribers appreciate the efficient and faithful work of telephone employes. This was shown recently when Miss Minna Riemer, local cashier and chief operator of the Clinton exchange of the Community Telephone Co. of Wisconsin, completed 25 years of service.

Learning of this anniversary, local business men presented Miss Riemer with a sum of money—one silver dollar for each year—to buy herself a gift. It was given, they said, in appreciation of her efforts in furnishing them wonderful service during the 25 years she had worked in the Clinton office.

FOR *Specialized* NEEDS IN DB MEASUREMENT

. . . choose from more than a dozen WESTONS

Keeping pace with today's exacting requirements for *specialized* power level indication, WESTON now offers more than a dozen different instruments for DB measurement, each one "engineered-from-bedrock" to meet the precise needs of one or more types of service.

Newest of the group is the multi-range Model 695 type 11, a medium speed instrument with a constant impedance network maintaining 20,000 ohms at the terminals for all ranges. Voltage ranges are 2, 5, 8, 20, 50, 80 and 200 volts, with associated DB values. The high, constant impedance reduces the effect of the instrument on the circuit to a negligible value, and at the same time all ranges will track on the same volt and DB scales. The broad coverage of this instrument with its high, constant impedance and high accuracy has led to its widespread application in the measurement of audio frequency signals of all kinds.

Why risk basing your choice of power level indicators on anything less than the full range of instruments now available? A new WESTON bulletin, "Power Level Indicators," brings complete *modern* specifications. Weston Electrical Instrument Corporation, 576 Frelinghuysen Avenue, Newark, New Jersey.

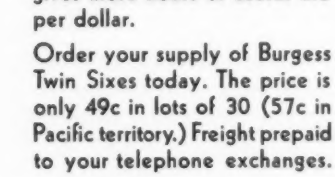
Model 695
WESTON
Constant Impedance
DB Meter

WESTON *Instruments*

To Managers—
who want to reduce costs and give better service this year

Select your batteries on a true economy basis. Consider ease of handling. Consider installation costs. Consider the amount of clear, dependable service they render. Specify the Burgess Twin-Six—the battery that answers your requirements and gives more hours of useful life per dollar.

Order your supply of Burgess Twin Sixes today. The price is only 49c in lots of 30 (57c in Pacific territory.) Freight prepaid to your telephone exchanges.



Burgess 12F3 4½-volt Dry Switchboard Battery is specially built for heavy, continuous drain and will give much more economical service than groups of ordinary telephone cells built for light drain. Gives 1100 hours of continuous service at 100 milliampere drain if replaced at 2.7 volts. 300 Extra hours of service! Price is only $2.45 ($2.90 in Pacific territory).

BURGESS BATTERY COMPANY
FREEPORT, ILLINOIS

BURGESS
TELEPHONE BATTERIES

The Operators' Corner

By MRS. MAYME WORKMAN
Traffic Supervisor, Illinois Telephone Association, Springfield, Ill.

REASON why restricted repetition is the approved form of acknowledgment. Series No. 323

IT IS INFERRED from questions No. 4 and No. 5 in this series that we still have some "Doubting Thomases" among us when it comes to *restricted repetition.* But as the writer told a chief operator on one occasion, when she was reluctant about adopting this approved form of acknowledgment, "Fifty Thousand Frenchmen can't be wrong."

However, the writer was a "Doubting Thomas" too, when this method was first introduced, being of the opinion prevalent at that time that operators would ring all sorts of wrong numbers if they were not permitted to repeat the called number.

Realizing that new operating practices are not incorporated as standard practices until they have been thoroughly tested and tried, the writer started to make inquiry as to the reason for adopting the practice in question and what effect it would have upon the accuracy of the service. The reasons given and answers supplied were ample, adequate and satisfactory.

"Thank, you," first of all is a courteous form of acknowledgment, and as all forms of acknowledgment serve the same purpose—that is, to let the customer know we have understood his order and that we will comply with his request—we may as well use a courteous acknowledgment phrase. It should always be remembered that courtesy is one of the three essentials of satisfactory telephone service.

What is the meaning of "Thank, you" when used as an acknowledgment phrase? We say "Thank, you" to a customer when he gives us an order for service, the only thing we have to sell, just as a grocer says "Thank, you" to his customer in acknowledging an order for the merchandise he has to sell.

Getting back to accuracy, it was found—in making traffic studies for an extended period—that a higher percentage of wrong numbers was reached in exchanges where numbers were repeated than in exchanges where restricted repetition was used. "Why?" Because where the number was repeated, in a high percentage of cases the subscriber failed to correct the operator when she repeated a wrong number, while in other cases the subscriber failed to acknowledge the repetition entirely.

In exchanges where the operator was not permitted to repeat the number, but acknowledged the calls by saying, "Thank, you," the operators listened more attentively to the order, concentrating on the number called. If they failed to understand the order, or if they were doubtful of the called number, they requested the subscriber to give them the order again, saying, "What number, please?"

The saving of operator's time, except in the very large office, is a small part of the benefit derived from the restricted method of repetition. The major item is "increased accuracy" and "improved public relations."

If you have not adopted this method in your exchange, talk it over with your manager, and if he agrees to try it out, you will be gratified with the beneficial results.

Questions from Illinois Operators

1. On a collect station-to-station call, called station says, "no one here to accept charge;" calling party says, "I'll try later." Does call take the person-to-person rate?
2. When a party reports ready to talk on a leave word call, should the operator give the "WH" to the toll center operator or just connect him with the Long Distance operator?
3. On a collect call to a private branch exchange, how long can you wait for an OK before it takes the person-to-person rate (the PBX operator keeps asking you to wait)?
4. Why can't an operator repeat the subscriber's number instead of using the phrase, "What number, please?"
5. Why should speed be considered more important by using "Thank, you" than accuracy in repeating your number?

The answers to these traffic questions are given on page 40.

Financial News and Data

Lincoln (Neb.) T. & T. Plans Large Betterment Program

John H. Agee, general manager of the Lincoln Telephone & Telegraph Co., reported at the annual meeting of the stockholders held recently at Lincoln, Neb., that in spite of declining revenues the company budget for 1938 will total nearly a million dollars. Of that amount $750,000, he states, will be expended on the Lincoln exchange, largely on bettering long distance facilities.

Total revenues of the company for the year were $2,738,750 and total expenses, $2,165,357. The greatest increase in expenses was in the matter of taxes, which increased $39,506 over 1936. In 1929 the taxes totaled $184,000; last year they were $274,000.

Earnings, Mr. Agee said, were sufficient to enable the company to maintain a high standard of service, pay common and preferred dividends and pass a small sum to surplus. For the first time in its history, the pension fund of the company, which pays benefits in addition to social security provisions, exceeded half a million dollars. The money is held in trust by the Bankers Trust Co. of New York. Forty-three former employes are now beneficiaries of this fund.

With the general improvement in business the company gained 731 stations during the first six months of 1937, only to lose them during the last half year with business recession and the drought as the chief contributing factors.

Directors elected for the ensuing year were: Frank H. Woods, Thomas C. Woods, John H. Agee, C. N. Beaver, G. E. Coddington, Joseph Grainger, L. E. Hurtz, Christian Klem, L. B. Stiner, Charles Stuart, Mark W. Woods, George J. Woods, and Frank H. Woods, Jr.

The directors elected officers as follows: Frank H. Woods, president; John H. Agee, vice-president and general manager; Thomas C. Woods, vice-president, and H. W. Potter, secretary-treasurer.

The executive staff of the company is comprised of: I. J. Devoe, general auditor; H. F. McCulla, general commercial superintendent; M. T. Caster, general plant superintendent; R. S. Brewster, general traffic superintendent, and H. H. Wheeler, Jr., chief engineer.

The annual report of the Lincoln company, filed with the Nebraska State Railway Commission shows gross revenues of $2,738,750, an increase of $42,907 over 1936. Exchange revenues were $1,866,464, an increase of nearly $20,000, and a similar increase was shown in miscellaneous revenues of $167,696. Toll revenues were $718,552, a slight decrease over the previous year.

Traffic expenses were $423,826, commercial $306,715 and general and miscellaneous $217,269, making a total of telephone operating expenses of $947,810, an increase of $17,009.

Maintenance costs were $532,880, an increase of $24,440; depreciation $410,300, an increase of $6,478, and taxes, $274,362, an increase of $39,506. Total telephone expenses were $2,165,352, an increase of $65,431, leaving net telephone earnings of $573,398. With sundry net earnings of $71,306, added, there was a total net income of $644,712.

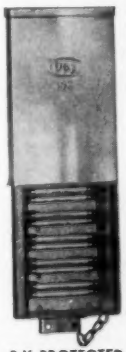
Interest payments were $163,178; preferred stock dividends, $342,587 and common, $119,445, a total dividend pay-

AS TIME MARCHES ON

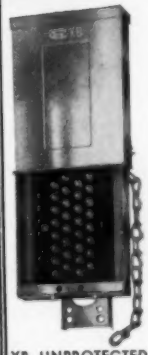
JUST as surely as hour follows hour into the years, you can depend on Cook Terminal and Protection Equipment for dependable, uninterrupted service, while these years are passing into decades. With confidence born of experience, leading telephone engineers are specifying COOK for terminals and protectors for this year's rebuilding and expansion.

Performance, positive protection, and long life are a few reasons why COOK equipment will give you a higher standard of service at a low maintenance cost.

S-6 PROTECTED 11-51 Pair



S-X PROTECTED 4-5-6 Pair



XB UNPROTECTED 11-16-26 Pair

"O" Type Sub-Station Protector

BE SURE—ALWAYS SPECIFY

COOK

TERMINAL AND PROTECTION EQUIPMENT

COOK ELECTRIC CO.

2700 Southport Ave., Chicago

KLEIN CLIMBERS

Klein Climbers are made in standard and "light weight" styles, each the finest for its particular use.

Going up a sixty foot stick — working on wires high above the ground — a slip might be fatal — a spur that cut out a genuine hazard. The lineman throws his weight on his climbers with calm confidence — he knows they are Kleins. Klein Climbers, like all Klein tools, are the standard of quality in the electrical and public utility field.

DISTRIBUTED THROUGH JOBBERS

Foreign Distributor: International Standard Electric Corp., New York

The four pamphlets listed below will be sent without charge to anyone interested. Check the ones you want:

- ☐ Safety for the Pole Climber.
- ☐ Specifications on Linemen's Belts and Safety Straps.
- ☐ The Safety Factor on Linemen's Leather Goods.
- ☐ Pocket Tool Guide.

Mathias KLEIN & Sons
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ment of $462,032. There was passed to surplus the sum of $19,542.

The company has assets of $15,838,588, including: Common stock outstanding, $1,991,535; preferred stock, $5,709,700; bonds, $3,500,000; depreciation reserve, $3,205,871; and surplus, $422,115.

Stations operated at the close of the year were 65,366, a loss of 73. Of these 37,500 are manual and 27,866 dial, with 53,778 main stations, 5,377 stations on private branch exchanges and 6,209 extensions.

▼ ▼

Recent Prices of Telephone Securities

(These quotations, as of March 19, 1938, are furnished by W. C. Pitfield & Co. Inc., 120 S. La Salle St., Chicago, Ill.)

TELEPHONE BONDS

	Bid	Asked
American Utilities Service Corp., 6s, 1964	58½	62
Ashland Home Telephone Co., 4½s, 1961	99½	..
Associated Public Utilities Corp., 5s, 1947	62	64
Associated Telephone Co., Ltd., 4s, 1965	103½	105½
Associated Telephone & Telegraph Co., 5½s, 1965	66½	70½
British Columbia Telephone Co., 5s, 1960	107	..
California Water & Telephone Co., 5s, 1965	99	100½
Central Electric & Telephone Co., 5s, 1955	94	97
Central Iowa Telephone Co., 5½s, 1947	97	99
Central Telephone Co. of Delaware, 6s, 1938	12½	15
Citizens Independent Telephone Co., 4¼s, 1961	102	104
Commonwealth Telephone Co. of Pennsylvania, 5½s, 1945	69½	72½
Commonwealth Telephone Co. of Wisconsin, 4s, 1966	95¾	97½
Community Telephone Co., income 5s, 1949	10	13
Continental Telephone Co., 5s, 1953	87	90
Cumberland Valley Telephone Co., 5s, 1966	99½	101½
Florida Telephone Corp., 6s, 1945	89	92
Florida Telephone Corp., 6s, 1954, second mortgage	70	72
Gary & Co., Theodore, 6% income notes, $5 par	2	3
Home Telephone & Telegraph Co. of Fort Wayne, Ind., 5½s, 1955	104½	..
Home Telephone & Telegraph Co. of Fort Wayne, Ind., 6s, 1943	105	..
Indiana Associated Telephone Co. 4½s, 1965	103½	105
Indiana Central Telephone Co., 5½s, 1938	88½	91½
Illinois Communities Telephone Co., 6s, 1949	41½	45½
Illinois Commercial Telephone Co., 5s, 1960	93½	95½
Illinois Commercial Telephone Co., 5s, 1948	96	99
Inland Telephone Co., 6s, 1948	79½	82½
Interstate Telephone Co. of Idaho, 5s, 1961	96½	99½
Interstate Telephone & Telegraph Co., 5½s, 1953	84½	88
Investors Telephone Co., 3s, 1961	46½	49½
Iowa Illinois Telephone Co., 3s, 5½s, 1949	flat	33 36
Jamestown Telephone Corp., 5s, 1954	104	..
Kansas Telephone Co., 6s, 1939	flat	39 42
Keystone Telephone Co. of Philadelphia, 6s, 1951	95½	98½
Keystone Telephone Co. of Philadelphia, 5½s, 1955	92	95
La Crosse Telephone Co., 5½s, 1948	102	104
Lexington Telephone Co., 6s, 1944	97	99
Lorain Telephone Co., 5s, 1958	101	103
Michigan Associated Telephone Co., 5s, 1961	102	104
Middle States Telephone Co. of Delaware, 6s, 1947	97½	99
Middlewestern Telephone Co., 6s, 1943	75	80
Missouri Telephone Co., 4¼s, 1961	99½	103
Ohio Associated Telephone Co., 4½s, 1966	99	101½
Ohio Central Telephone Co., 6s, 1947	92	94½
Pennsylvania Telephone Corp., 4s, 1965	105¾	107½
Pike County Telephone Co. of Indiana, 6s, 1946	flat	40 43
Pike County Telephone Co. of Illinois, 6s, 1939	102	..
Platte Valley Telephone Corp., 6s, 1947	97½	99½
San Angelo Telephone Co., 5s, 1958	101½	102½
Santa Barbara Telephone Co., 3½s, 1966	99½	102
Southwestern Associated Telephone Co., 5s, 1961	88	92
Southwestern States Telephone Co., 6s, 1948	48½	51½
Southwestern States Telephone Co., 6s, 1949	47	50
Standard Public Service Co., 6s, 1948	46	49
Telephone Bond & Share Co., 5s, 1958	56½	59½
Telephone Service Co. of Ohio, 5s, 1953	66½	69½
Tri-County Telephone Co., 4½s, 1956	100½	103
United Telephone Co. of Delaware, 6s, 1948	84½	87½
United Telephone & Telegraph Co., 5½s, 1953	95½	98½
United Telephone & Telegraph Co., 6s, 1953	99	102
Wabash Telephone Co., 4½s, 1956	99½	102
Warren Ohio Telephone Co., 6s, 1943	93	96
West Coast Telephone Co., 5s, 1953	90	93
Western Light & Telephone Co., 5s, 1954	95½	98½

PREFERRED STOCKS

	Bid	Asked
Associated Telephone Co., Ltd., $1.25	22	24
Associated Telephone & Telegraph Co., 7% first	38	42
Associated Telephone & Telegraph Co., $6 first	37	41
Associated Telephone & Telegraph Co., $4 cumulative	6½	8½
Bell Telephone Co. of Pennsylvania, 6½%, $100 par	116	119
California Water & Telephone Co., 6%, $25 par	20	23
Central Electric & Telephone Co., $50 par	22½	25½
Community Telephone Co., $2 cumulative, no par	¾	3
Commonwealth Telephone Co. of Wisconsin, 6½%, $100 par	82½	86
Continental Telephone Co., 7% first	78	83
Continental Telephone Co., 6½% first	75	80
Diamond State Telephone Co., 6½%, $100 par	110	..
Empire Telephone Co., 6% cumulative class "A," $25 par	11	15
Florida Telephone Corp., 6% cumulative, $100 par	39	..
Gary & Co., Theodore, first $1.60 pfd.	2	3
General Telephone Allied Corp., 6% convertible	86	89
General Telephone Corp., $3 convertible	43	46
Home Telephone & Telegraph Co. of Fort Wayne, 7%, $50 par	50	..
Illinois Commercial Telephone Co., $6	78	81
Interstate Telephone & Telegraph Co., first pfd. "A," 6%	41	46
Jamestown Telephone Corp., 5% cumulative, $100 par "A"	100	..
Jamestown Telephone Corp., participating pfd., $100 par	100	..
Keystone Telephone Corp., $4 cumulative, no par	6	9½
La Crosse Telephone Co., 6% prior	95	98½
Lexington Telephone Co., 6½% prior	30	40
Lincoln Telephone Co., 6% cumulative, $100 par	102	106
Lorain Telephone Co., 6% cumulative, $100 par	95	98
Middle States Telephone Co. of Illinois, 7%	93	97
Mount Vernon Telephone Co., 6% cumulative, $100 par	87	91
Northern Ohio Telephone Co., 7% cumulative	101	..
Ohio Central Telephone Co., 7% first	48½	55½
Ohio Service Holding Corp., $5 pfd., $5 par	35	40
Pacific Telephone & Telegraph Co., 6%, $100 par	102	106

	Bid	Asked
Peninsular Telephone Co., 7% cumulative	106½	110½
Pennsylvania Telephone Corp., 6% cumulative	104	107
Rochester Telephone Corp., 6½% cumulative	111	..
The Southwest Telephone Co. of Delaware, 7%	½	2
Southwestern Bell Telephone Co., 7% cumulative pfd.	120	123½
Telephone Bond & Share Co., 7% first	18	23
Telephone Bond & Share Co., $3 first	12	..
Telephone Bond & Share Co., participating pfd.	7	..
Union Telephone Co., $1.70 pfd., $25 par	2	4
United Telephone & Electric Co., 6% cumulative	17½	21½
United Telephone & Electric Co., 7% cumulative	21	25½
Warren Ohio Telephone Co., 7%, $100 par	38	44
West Coast Telephone Co., 6%, $25 par	16	19
Western Light & Telephone Co., $1.75 first, $25 par	20	23
Wisconsin Telephone Co., 7%, $100 par	116	119½
COMMON STOCKS		
American Telephone & Telegraph Co.	126	130
Associated Telephone & Telegraph Co., class "A"	4	6
Bell Telephone Co. of Canada	158	162
Central Electric & Telephone Co.	⅝	1
Empire Telephone Co.	1½	3½
Florida Telephone Corp.	5	8
General Telephone Corp.	8	12
Home Telephone & Telegraph Co. of Fort Wayne, $50 par	54	58
Illinois Bell Telephone Co.	152	156
International Telephone & Telegraph Corp.	6½	8⅛
Investors Telephone Co., $100 par	9	11
Lincoln Telephone & Telegraph Co., class "A"	30	34
Middlewestern Telephone Co.	2	6
Mountain States Telephone & Telegraph Co.	113½	116½
New England Telephone & Telegraph Co.	97½	102
Northern Ohio Telephone Co.	65	..
Penninsular Telephone Co.	21	25
Telephone Bond & Share Co., class "A"	1	3
Western Light & Telephone Co.	¾	1

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Increasing Expenses Exceed Ohio Bell Operating Revenue

An increase in The Ohio Bell Telephone Co.'s operating expenses exceeded an increase in operating revenues in 1937 as the result of a larger payroll and other major factors, including higher taxes, which added to the cost of furnishing telephone service, according to the annual report of President Randolph Eide.

"Total telephone revenues amounted to $41,920,140, an increase of $2,649,-264, or 6.7 per cent over 1936," Mr. Eide states. "Although total telephone revenues have increased each year since 1933, they are still $2,443,022 under the peak year of 1930. Total operating expenses, excluding taxes, were $26,426,-962 in 1937, an increase of $2,968,775, or 12.7 per cent higher than in 1936."

Pointing out that operating taxes were the highest in the company's history and still continue as one of the major factors influencing the cost of telephone service, the report said that "taxes assignable to operations for 1937 were $5,695,692, and amounted to $8.55 a telephone for the year, or 71 cents a telephone a month."

Referring to wage and personnel increases as major factors contributing to greater operating expenses, the report said that at the close of 1937 the company had 10,195 employes, an increase of 1,178 during the year. Total 1937 payroll expenditures were $16,569,-336, an increase of $2,520,120 over 1936, or nearly 18 per cent. The report said that this amount represents wage increases during the year and payments to new employes added to the force.

The company had the greatest yearly net gain in telephones in its history, but there was a slowing up toward the end of the year which corresponded to the "definite contraction" in general business, according to this excerpt from the report:

"The improvement in business for the year as a whole was accompanied by a demand for more telephone service. There was a net gain in telephones of 69,114, or 11 per cent. This represents a gain greater than heretofore experienced in any year by the company. The gain in the previous peak year, 1929, was 62,260.

Although the company had in service 695,430 telephones at the end of 1937, it is still 26,402 telephones short of the maximum development which was reached in 1930. Of the net loss in telephones experienced during the depression years, 86.6 per cent has been regained. The rate of gain during the last quarter of 1937 slowed down noticeably.

In order to gain 69,114 telephones in 1937, it was necessary to handle 228,155 connections and 158,923 disconnections, a total of 387,078, or about six for each net gain of one telephone."

Mr. Eide said that the cost of the Ohio Bell plant in service at the end of 1937 was $177,669,878. He gives 5.61 per cent as the average rate of earnings on average plant in service for last year, as against 6.09 per cent in 1936.

"During 1937 there were handled 1,175,000,000 local connections, an increase of 139,000,000, or 13.4 per cent over 1936," said Mr. Eide in discussing traffic. "Calls between cities numbered 23,200,000, an increase of 2,300,000, or 10.9 per cent over 1936.

"Local connections, which are completed within a few seconds, were handled without error 99 per cent of the time. The average time required to complete long distance calls was only 1½ minutes."

Stating that of the company's 695,-430 telephones in service, 65 per cent are automatic, President Eide continued: "With the conversion to dial operation in 1938 of our Springfield office, we will inaugurate toll line dialing between Springfield, Dayton and Columbus and small adjacent exchanges.

"This is the first installation of this method of handling long distance serv-

SANDS

THE TYPE 12 SUB-STATION PROTECTOR

This popular type of indoor protector consists of two blocks of porcelain—the line end being equipped with fuse clips only while the other end has fuse clips, ground connection and a well for the discharge blocks. Regularly equipped with seven-ampere, fiber-type fuses with nutted ends, and Type 2105 discharge blocks. Write for further information regarding this and other Sands protective devices.

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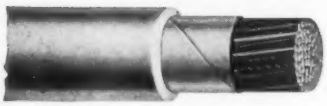
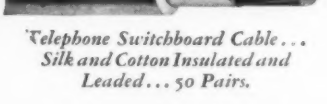
ROEBLING
electrical
Wire & Cable

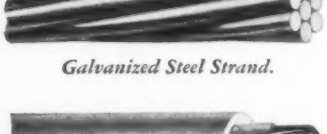


Telephone Switchboard Cable... Silk and Cotton Insulated and Leaded... 50 Pairs.

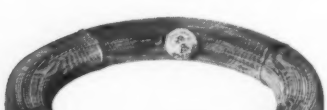


Twisted Pair Telephone Wire... Rubber Insulated and Braided.

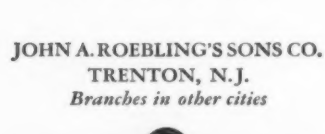
Bare Copper or Bronze Wire.



Galvanized Steel Strand.



Telephone Cable... Paper Insulated and Leaded... 150 Pairs.



Bare Galvanized Steel Wire.

JOHN A. ROEBLING'S SONS CO.
TRENTON, N.J.
Branches in other cities

ONLY A FINE PRODUCT MAY BEAR THE NAME ROEBLING

ice in the company, and will permit the toll operator to dial directly the subscriber's number at the distant exchange, thereby further improving the speed and accuracy of the long distance service."

Commenting on continued improvement of service in the company's smaller exchanges and in the rural districts, he said:

"Developments in equipment have made it practicable to furnish dial service in these smaller communities and rural areas similar to that furnished in the larger cities. During the year, eight such small offices were converted to dial operation, and 18 more exchanges are on the program for the year 1938.

In addition to changing the equipment, the program includes considerable rebuilding and extension of outside plant, rearranging more uniformly the number of parties on rural lines, and improving transmission."

Mr. Eide described the rate reduction made in April 1, 1937, as the largest in its history, resulting in savings to customers of nearly $2,000,000 a year, and added: "This reduction, together with other adjustments in local and long distance rates made prior to that date and amounting to a saving to the public of more than $500,000 a year, makes an aggregate reduction in telephone rates in recent years of $2,500,000 a year...

"Many thousands of our customers have been able, as a result of these rate adjustments, to avail themselves of a better grade of service, or of a larger use at no additional or at less cost. Several local service areas in our territory were extended during the year to include adjacent exchanges, and boundaries were adjusted to meet more generally the service requirements of contiguous areas."

As to the company's personnel, President Eide, among other comments, said:

"The success of the business and the quality of telephone service are dependent on the men and women in the organization. Employes are selected carefully, and they are taught thoroughly the craft technique of their respective jobs by competent people.

Our supervisory and training people have met this problem in an efficient manner. The new employes not only have learned their jobs well but have caught the spirit and objectives of the company with respect to its policy of furnishing, at all times, an adequate, dependable telephone service at reasonable cost consistent with financial safety.

Practically all the supervisory people and officers of the company have come up from the ranks. The growth of the business has made it possible to promote a large number of men and women to positions of greater responsibility. A policy of systematic training of employes for new and more important jobs is carried on consistently. Much retraining has also been done on old jobs. The company has continued with gratifying results its educational work in first aid and accident prevention."

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International T. & T. Shows Increase in 1937

The preliminary annual report of the International Telephone & Telegraph Corp. and subsidiaries for 1937 shows a consolidated net income of $10,236,-148 after expenses and charges, but not including any income or losses on Spanish subsidiaries. This compares with a net of $4,009,103 in 1936. Gross telephone operating revenues of the company and its subsidiaries for the year aggregated $32,476,000, against $26,751,000 for 1936.

Gross income from all sources, including sales by manufacturing subsidiaries, amounted to $63,632,082, compared with $52,920,218 in the preceding year. Operating expenses, including taxes, rose to $43,334,674 from $39,-322,165.

The report, which is signed by Sosthenes Behn, president, points out that sales by the manufacturing subsidiaries were at a record level amounting to over $82,000,000. "More than $100,-000,000 in orders were received during the year and orders on hand on Jan. 1 were in excess of $60,000,000, compared with $40,000,000 at the beginning of 1937," President Behn added.

▼ ▼

Annual Report of Geneseo (Ill.) Cooperative Company

The Geneseo Cooperative Telephone Co., of Geneseo, Ill., reports a gain of 157 telephones last year, bringing the total as of December 31, 1937, up to 1,861. Total revenues for the year were $26,097 and expenses, $19,313. Direct taxes, amounting to $3,025, represent an expense of $2.75 per telephone. Regular 8 per cent dividend payments amounted to $2,800. The company's assets, totaling $73,666, include a plant investment of $69,271.

In order to eliminate inductive interference caused by the construction of an electric transmission line, it was necessary for the company to metallicize three miles of telephone line east of Geneseo, at a cost of $10 per subscriber. It is expected, however, that the cost of making other lines metallic in the future may cost as high as $15 to $20 per subscriber.

Condensed Telephone News

New Companies and Incorporations

VALPARAISO, IND.—Articles of incorporation have been filed with the Indiana secretary of state by the Northwestern Indiana Telephone Co., Valparaiso, formed to operate a telephone business. The company has 1,500 shares of common stock valued at $1 a share and 179 shares of preferred valued at $100 a share and 140 shares of second preferred valued at $100 a share.

Telephones

NEW YORK, N. Y.—The New York Telephone Co. reports a net gain of 1,767 telephones in service during February, as compared with a gain of 11,512 instruments in February, 1937. For the first two months of this year the company had a total gain of 5,002 telephones in operation, against an increase of 24,211 stations in the first two months of last year.

NEW YORK, N. Y.—General Telephone Corp. reports for its subsidiaries a gain of 779 company-owned telephones for the month of February, 1938, as compared with a gain of 2,334 telephones for the month of February, 1937. The gain for the first two months of 1938 totals 1,727 telephones (exclusive of purchases) or .47 per cent, as compared with a gain of 4,144 telephones, or 1.24 per cent for the corresponding period of 1937.

The subsidiaries now have in operation a total of 365,140 company-owned telephones.

CINCINNATI, OHIO.—Stations in operation by Cincinnati & Suburban Bell Telephone Co. as of February 28, totaled 178,859, a gain of 407 over January and 12,939 above the 165,920 operated in February, 1937.

COLUMBUS, OHIO.—The number of Ohio Bell Telephone Co. stations in Columbus was increased 162 during the month of February, bringing the total number in service at the end of the month to 78,777. During that month 1,125 telephones were connected and 963 disconnected. The total number of connections was considerably under that of the same month in 1937 when 1,561 telephones were connected.

PHILADELPHIA, PA.—The Bell Telephone Co. of Pennsylvania had a net gain of 1,752 telephones in operation in February, against a gain of 10,282 in February, 1937. For the first two months of the current year, the net gain was 4,499, compared with one of 19,230 in the corresponding period of 1937.

Elections

GARRETT, IND.—Officers and directors of the Garrett Telephone Co. were re-elected at the annual meeting as follows: President, L. D. Mager; vice-president and general manager, D. B. VanFleit; treasurer, H. M. Brown; secretary and auditor, H. E. Wert. The directors are Messrs. Magar, VanFleit, Brown, Wert and W. W. Sharpless of Garrett and D. H. Witham of Indianapolis.

CHISAGO CITY, MINN.—At the annual stockholders' meeting of the Chisago City Telephone Co. the following directors were elected: Ernest Johnson, Albert Peterson, C. E. Swenson, Chas. Strand and J. A. Peterson.

Officers elected are: President, C. E. Swenson; vice-president, J. A. Peterson, and secretary-manager, Ernest Johnson.

Albert Peterson, who is a new director, continues as plant superintendent.

The company has 380 company-owned telephones with no switching stations. Collections are 100 per cent with a gain of 26 telephones during 1937, it is reported. Depression emergency rates are still in effect.

Miscellaneous

ARCOLA, ILL.—The Illinois Consolidated Telephone Co., which purchased the local Arcola Telephone Co. after fire destroyed its exchange last fall, restored communication in the community within record time upon assuming control early this year. E. A. Purcell, general manager of the company, was in direct charge of the local work.

An estimate of $5,000 was placed on the new semi-colonial exchange building. New central office equipment was installed.

INDIANAPOLIS, IND.—W. L. Parrish, assistant engineer in the plant department of the Indiana Bell Telephone Co., has just celebrated his 30th anniversary of continuous service in the telephone industry.

FORT WAYNE, IND.—Hundreds of patrons of the Home Telephone & Telegraph Co. recently were without service as wires and poles broke due to a severe sleet storm here. Complete telephone exchanges were out of commission in the vicinity of Auburn and Garrett, Ind., where service was paralyzed and thousands of dollars in damage done to telephone systems.

SPEARVILLE, KANS.—L. R. Harrington, of Spearville, has purchased the telephone exchange at Ogallah, operated by the Interstate Public Utilities Corp.

DEEP CREEK, WASH.—The Deep Creek Telephone Co., a farmer-owned telephone service with 16 subscribers in the district between Deep Creek and Reardan, has been purchased by the Interstate Telephone Co.

The service was started 35 years ago to serve five customers and was originally operated via barbed-wire fence lines.

The Interstate company has recently taken over another farmer service in the Wenatchee district, which provides telephone service for 50 customers, Clarence Johnston, manager of the Interstate company, stated.

Obituary

FAIRMONT, NEB.—J. H. Haberman, for 26 years an employe of the Lincoln Telephone & Telegraph Co., beginning as a lineman and later serving as exchange manager at various points, died recently in California, where he had gone for his health after resigning as manager at the Fairmont exchange and taken up lighter duties. His brother, Chris Haberman, is company manager at the Friend exchange.

Reliable

TELEPHONE BRIDGING CONNECTORS

Create a new standard in solderless connectors.

A hinged mechanism at end of bolt prevents nut from being dropped.

Top view shows a correct copper to iron connection with a No. 109W connector. Other illustrations show a No. 104N connector for use on copper to copper connections.

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1145 CAROLL AVENUE CHICAGO, ILLINOIS

"Telephony's" Engineering Data

By B. C. BURDEN

Index, General.
March 26, 1938.
No. 43-A, Page 143.

Theory and Practice of the Magneto Telephone Exchange—(Ctd.)

Guying Computations—Smaller Companies

The smaller telephone companies seldom find occasion to compute the exact size of guy and anchorage arrangement necessary for a specific situation. In most cases the usual size of guys and anchors employed for typical loads will be known from experience as well as observation of the lines of the larger operating companies; hence there will be little necessity for computing the strength of each guy to be placed.

There is, however, occasional need for knowledge on the basic features of guy design. A typical example would be in connection with railroad crossings. The National Electric Safety Code specifies that telephone lines which cross over main railroad tracks must be of Grade D strength. If the letter of the code is to be followed, then it may become necessary to compute the strength requirements for specific crossings which are being placed, to insure that they are up to standard. The fundamental steps in guy design are explained in the following paragraphs:

Design Based on Guys Carrying Entire Load

The design of guys, especially where the guys are being placed to meet the code requirement, is based on the fundamental rule that the *guys are to be considered as taking the entire load in the direction in which they act;* the poles are assumed to act as struts only. That is, we ignore the fact that the pole itself would, in effect, support a portion of the load.

Guying computations may be considered as involving two basic operations: The first step is to determine whether or not the unguyed pole would have adequate strength to carry the load imposed. If it is found that the unguyed pole is not strong enough to carry the load and that a guy is needed, computations are made to determine the *size of strand* that will be required for the *lead height ratio* to be used with the guy that will be placed.

Typical Guying Design Problem

Let us take a typical example and work it through to completion. We will assume that we have a 40-wire, 104 copper toll lead crossing over the main line of a railroad. We wish to know what size side and head guys will be re-

quired in order for the crossing to conform with the National Electric Safety Code recommendations.

Let us assume that the crossing poles are pine poles with a ground-line circumference of only 30 inches, and that the adjacent spans on each side of the crossing span are 125 feet in length. This crossing is shown in Fig. 138.

Reference to Handbook No. 10 of the National Electric Safety Code shows us that communication conductors crossing over the main tracks of railroads must be Grade D con-

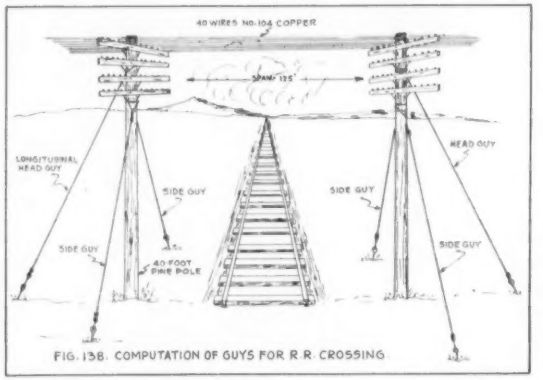

FIG. 138. COMPUTATION OF GUYS FOR R. R. CROSSING

struction and that guys used for taking the transverse load must be designed so as to have a safety factor of 2. In other words, they must be large enough so that the maximum load imposed will not be greater than one-half of their working strength.

The code further states that for Grade D construction, unguyed poles must be designed to have a safety factor of 4 for transverse loads and 2 for longitudinal loads. (Note: This is for untreated poles.) The code also specifies that head guys be used for all crossing poles where there are more than two communication conductors carried.

From what has just been said, it is apparent that the total foot-pound load imposed at the ground line of a pole, due to the transverse forces acting on it, must not be greater than one-fourth (safety factor of 4.0) of the resistant moment of the pole in question.

Computing Total Transverse Force

Our first step is to compute the total transverse load in foot-pounds on the crossing poles. The force imposed at the ground line of a wooden pole, due to the wind acting on wires and ice coating (assume heavy loading area in example), is computed by the simple equation $Mg = PL$; where Mg is the bending moment in foot-pounds at ground line, P the pressure in foot-pounds acting against the load center of the pole and L length of pole in feet from ground line to the load center.

The pressure in foot-pounds acting against the load center can be computed by the simple equation $P = WNSD$. In this equation N = number of wires; S = one-half of the sum of the lengths of the two spans adjacent to the crossing pole; D = the diameter in feet of one wire, and W = wind pressure in pounds per square foot (8 pounds for heavy, 12 pounds for light loading areas).

On multi-wire leads where the total number of wires is greater than 10, only two-thirds of the total number of wires are considered as being effective due to the shielding effect of adjacent wires; hence, in the equation $P = WNSD$, for the number of wires, take only two-thirds of 40 or 26.

In substituting the values given in the formula for pressure against the load center of the pole, we get $P = 8 \times 26 \times 125 \times .092 = 2{,}392$ pounds of pressure at the top of the pole.

The force tending to break the pole at the ground line would be $Mg = PL$ or $2{,}392 \times 34.5 = 82{,}524$ foot pounds force at the ground line of the pole. The number 34.5 represents the height in feet from the ground line to the load center and assumes that the pole is set 6.5 feet in the ground and that there are two feet between crossarm centers.

Referring to a table showing the resistant moments for yellow pine pole having a ground-line circumference of 30 inches, we find that the resistant moment is 52,800 foot pounds. Inasmuch as a pole large enough to provide a safety factor of 4 with a load of 82,524 foot pounds would need to have a resistance moment of $4 \times 82{,}524$ or 330,096 pounds, it is evident that a 30-inch pole is far too small and *will need to be guyed transversely;* that is, with side guys in order to meet the Safety Code requirements for railroad crossings.

ommission and Court Activities

Bill in Congress Legalizes Wire Tapping

Chairman Lea of the House interstate commerce committee has introduced a bill making any use or attempt to use communication facilities under jurisdiction of the Federal Communications Commission, including telephone, telegraph or radio, to violate a federal law, a violation of law of itself, punishable by a fine or prison term.

The bill legalizes wire tapping and seizure of telegraph and radio messages when the head of a government department believes a violation of law is likely.

▼ ▼

Wisconsin Bell Labor Case Argument

On April 5 in Washington, D. C., the National Labor Relations Board will hear oral arguments in the Wisconsin Telephone Co. case which involves charges brought by the A. F. of L. affiliate, International Brotherhood of Electrical Workers, that the company favored the Wisconsin Independent Telephone Operators' Union and dominated it.

Hearings were held during February in Milwaukee before N R L B Examiner James C. Batten. (TELEPHONY of February 19 and 26).

▼ ▼

FCC to Investigate Chain Broadcasting

A sweeping investigation designed to bring out all available information essential to the proper regulation and conduct of radio stations engaged in chain broadcasting, ranging from the contractual rights and obligations of all stations to the alleged monopolistic practices of some of them, was ordered March 18 by the Federal Communications Commission.

The order for the inquiry, adopted by a vote of six to one, incorporates the proposal of Commissioner Craven that hearings be held to determine the truth or falsity of the "monopoly charges" against the industry, and obtain other information of an "economic character" for the clearer understanding of its problems.

The order adopted by the commission was proposed by Chairman Frank R. McNinch, in a motion seconded by Commissioner Sykes, with the exception of the following "whereas" clause, which was inserted on the motion of Commissioner Craven, in further citation of the reasons for the proposed investigation:

"Whereas, the commission has not at this time sufficient information, in fact, upon which to base regulations regarding contractual relationships between chain companies and network stations, multiple ownership of radio broadcast stations of various classes, competitive practices of all classes of stations, networks and chain companies, and other methods by which competition may be restrained or by which restricted use of facilities may result."

The one dissenting vote was cast by Commissioner Payne, who objected, though Commissioner Craven did not, to the substitution of the resolution adopted for that previously proposed by the latter.

The resolution previously proposed by Mr. Craven, who formerly was the commission's chief engineer, called for an investigation of the "monopoly charges" by a committee consisting of three commissioners to be appointed by the commission to conduct hearings and otherwise to fulfill the requirements of the order. The investigation was urged by Mr. Craven as "essential in the interest of the public as well as for the stabilization of an industry which in general has rendered excellent service to the American public."

The order proposed by Chairman McNinch and adopted March 18 provides for an investigation by the full commission and for hearings to be held in connection with such investigation "at such times and places as the commission shall designate."

▼ ▼

Seek Emergency Funds for Ohio Bell Case Fight

Having failed to secure an appropriation from the Ohio General Assembly with which to further prosecute the

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Ohio Bell Telephone Co. $18,500,000 state-wide rate case, Attorney General Herbert S. Duffy has made application to the state emergency board for $50,000 in emergency funds for this purpose. The application was taken under advisement.

In making this application, the attorney general informed the board that the funds were required to prosecute the case to collect refunds on alleged excessive rate increases. He added that he would be hampered in attempting a compromise unless the money is made available.

He told the board further that neither his office nor the Ohio Public Utilities Commission has the personnel or the funds to employ expert accountants and engineers to complete the data on the 44 exchanges involved in the rate litigation.

Brief Filed in Oklahoma Commission-Bell Case

S. J. Gordon, assistant counsel for the Oklahoma Corporation Commission, filed a brief March 17 with the Oklahoma Supreme Court in the case of the Southwestern Bell Telephone Co. vs. the Oklahoma Corporation Commission, which is an appeal from commission order No. 11,234, of May 5, 1937, dismissing the petition of the telephone company requesting that the commission change from an individual exchange basis to a state-wide basis in conducting its general investigation of toll rates of the company.

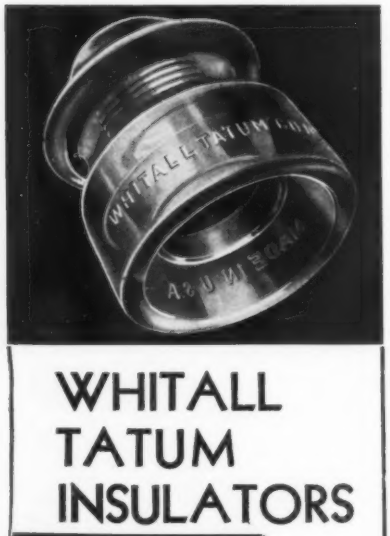
Attorney Gordon contended that the commission order, overruling the telephone company's petition, was procedural and merely announces the method of the commission in conducting a state-wide investigation of rates, which is to make its appraisals and inventories on an exchange by exchange basis.

Attorney Gordon, in his brief, stated further:

"To adopt a state-wide basis would necessarily impede the progress of the investigation, since the commission would have to make a detailed count and appraisal of every item of plant in each of the 144 exchanges owned by the company within the state, before finally arriving at a conclusion. When the last of the 144 exchanges are inventoried and appraised, the inventory and appraisal of the first exchange investigated would become useless and out-of-date, and a vicious circle is pursued."

Answers to Traffic Questions on Page 32

1. If the call is to be tried again as a station-to-station call, it will be considered as a new call. The original call is canceled and is subject to a report charge.
2. The tributary operator should make a memorandum of the report and say, "One moment, please," to the called party. Reach Long Distance and pass all the details received.
3. If the acceptance of the charge has not been secured at the end of the time allowance for holding the toll circuit, consider the call as equivalent to one on which the called station refuses to accept the charge, enter the report underlined, together with an explanation on the ticket, and if the calling party is holding the line, ask, "Will you pay for the call?" and proceed as directed.
4. Please refer to preface for answer.
5. Please refer to preface for answer.



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Summary of Commission Rulings and Hearings

Federal Communications Commission, Washington, D. C.

February 21: Application for a wire certificate filed with the telephone section by the Southwestern Bell Telephone Co. requesting authority to acquire interstate toll lines of the United Telephone Co. (Kansas).

March 3: Application for a wire certificate filed with the telephone section by the Indiana Bell Telephone Co. and the American Telephone & Telegraph Co. requesting authority to supplement existing facilities between Kokomo, Logansport and Peru, Ind.

February 25: Application for a wire certificate filed with the telephone section by the Illinois Bell Telephone Co. requesting authority to acquire and operate certain toll facilities of the North-Western Indiana Telephone Co., in the vicinity of Valparaiso, Ind.

Illinois Commerce Commission

March 22: Hearing in Springfield on application of the Bath Telephone Co. for an order authorizing the issue of $1,000 of its common stock.

March 22: Hearing in Springfield on (1) application of the Bath Telephone Co. for approval of contract covering purchase of the complete telephone plant and equipment at Bath and vicinity; (2) also application of the Bath Telephone Co. for a certificate of convenience and necessity to operate the telephone plant in and near the village of Bath, Mason County.

March 23: Hearing in Springfield in the matter of proposed advance in rates for telephone service in Cissna Park and surrounding rural district, stated in rate schedule I. C. C. No. 5 rendered by the Iroquois County Telephone Co.

March 23: Hearing in Springfield in the matter of proposed advances in rates for telephone service in Crossville stated in rate schedule I. C. C. No. 3 rendered by the Crossville Telephone Co.

Indiana Public Service Commission

March 18: Ruling that the Northern Indiana Telephone Co. had failed to show that a proposed tie-up with lines

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International Creosoting and Construction Co., Galveston, Texas.—Creosoted Southern Yellow Pine Poles. Plants: Beaumont and Texarkana, Texas.

MacGillis & Gibbs Company, Milwaukee, Wis.—Northern White and Western Red Cedar Poles. Plain or butt-treated. Immediate quotations on request.

T. M. Partridge Lumber Co., Minneapolis, Minn.—Northern White—Western Red Cedar Poles. Plain or butt-treated.

H. Sigalet & Company, Ltd., Lumby, B. C., Canada—Western Red Cedar Poles. Plain or butt-treated.

Valentine Clark Corporation, 2516 Doswell Ave., St. Paul, Minn.—Finished Cedar Poles. Plain or butt-treated.

of the Home Telephone & Telegraph Co. would result in improved service and decreased costs of service between North Manchester and Fort Wayne, order issued denying the Northern company's petition for the hook-up.

March 31: Additional hearing, postponed to this date, in the South Bend rate case of the Indiana Bell Telephone Co. The Indiana Bell asked the commission to rule on its petition to consolidate a number of rate cases into a state-wide case before the hearing is resumed.

Minnesota Railroad & Warehouse Commission

April 19: Hearing in Grove City on application of the Empire Telephone Co. for authority to change its present schedule of telephone rates at its Grove City exchange.

Missouri Public Service Commission

March 16: Complaint filed charging that telephone rates of the Southwestern Bell Telephone Co. at its Joplin exchange are excessive and discriminatory, and asking a reduction.

March 29: Hearing in Jefferson City on maintenance of telephone service between Bunceton and Boonville at the rates contained in the schedule filed by the United Telephone Co.

Nebraska State Railway Association

March 14: Application filed by the Lincoln Telephone & Telegraph Co. for authority to eliminate two-party residence rate at its Talmage exchange on the ground that no demand now exists and service no longer is being offered.

March 15: Informal complaint filed by J. E. Hirons, of Omaha, against the Northwestern Bell Telephone Co. alleging that further continuation of an extra charge of 25 cents a month inaugurated in 1928 when he asked for installation of loud-ringing bell because he is hard of hearing is not justified.

March 15: In the matter of the application of the Lincoln Telephone & Telegraph Co. for authority to offer inward call service on toll trunks, service now being limited to outward calls; it appearing to the commission that this is in the interest of better service and that as no increase in the charge of $2 a month is asked, granted as asked.

March 17: In the matter of the application of the Spalding Telephone Co. for authority to continue for another year its reduced schedule of rates; found reasonable and granted as asked.

New York Public Service Commission

March 15: Authorization given for transfer of plant of the Smyrna Telephone Co., Inc., to the Chenango & Unadilla Telephone Corp. for $4,300. The Smyrna company operates a small system in Smyrna and in part of the town of Sherburne, furnishing service to 89 subscribers.

Oklahoma Corporation Commission

March 17: Hearing on Cause No. 17,273 of the Southwest Telephone Co. and Cause No. 17,300 of the Southwestern States Telephone Co., Cleveland and McClain counties, vs. the Oklahoma Inter-county Electric Cooperative, of Norman. Complainants alleged that REA-backed rural power lines constructed by the cooperatives threaten serious inductive interference with their telephone lines and request that the cooperatives bear necessary expense of metallicizing or removing their lines.

Defendant cooperatives filed a motion asking the commission to dismiss the complaints on grounds that they are not public utilities and do not come under provisions of commission order No. 11,795, amending commission order No. 1946 governing compensation for inductive interference of electric power lines with telephone lines. Commission took motion under advisement and gave attorneys for each side 10 days to file briefs, 20 days in all.

It was stipulated that no further action be taken on other similar complaints until question of jurisdiction is decided.

March 17: Application of the Southwest Telephone Co. for increased monthly exchange rates at Purcell conditioned upon replacing the present metallic magneto system with a common battery system, was partially heard and continued until April 14 for hearing of evidence to be presented by L. T. Cooks, of Purcell, a protestant.

A. G. Davidson, Brownwood, Texas, commercial sales supervisor of the company, presented a petition signed by 286 subscribers requesting that the improvements be made and agreeing to increased rates. The Purcell Chamber of Commerce also agreed to the increase on the same conditions.

Mr. Davidson presented exhibits showing a net operating revenue loss of $218.29 for the year ended December 31, 1936, and an estimated net loss of $52.32 for the same period of 1937. He testified that if the proposed increase in rates is granted, net revenues of the company at Purcell would be about $1,300 annually.

Cost of the new program will be about $16,500, of which $7,000 will represent net addition to capital investment. A new building has been constructed, which the company has agreed to lease for its improved exchange, if its application is granted.

March 17: The commission heard the application of the Southwest Telephone Co. for increased monthly exchange rates at Lindsay, condition upon conversion from magneto to common battery service. A petition signed by 77 per cent of the subscribers approved the proposed increase in rates conditional upon installation of the improved service. The directors of the Lindsay Chamber of Commerce also approved the proposal.

Company witnesses presented a statement showing a net return of 3.2 per cent for the year ended December 31, 1936, on its present investment, and a net revenue of $465.95 for the first six months of 1937.

Ohio Public Utilities Commission

March 14: Petition filed by C. H. Hooley, R. F. D., Delaware, and 15 neighbors who are furnished rural service from the Delaware exchange of the Northern Ohio Telephone Co., in which they complained of the announced intention of the company to transfer them April 1 to the new automatic exchange at Lewis Center which has free service to Delaware. The complainants allege

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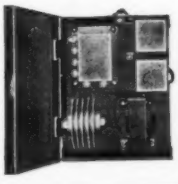

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